American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

APRIL 8, 1957 PRICE 50 CENTS

Unitized transfer machine has individual electric controls (inset) and hydraulic systems — see page 2

- **Ford's Automatic Gear Line** page 154
- **Modernization Made a Million** page 129

How to get TOP PRECISION PRODUCTION from your Heald Bore-Matics

Sharpen your tools with Heald Precision on a Model 3 Tool Sharpener

HERE, in the plant of a large and progressive automotive manufacturer, is a "production line" for producing *precision production!* These Heald Model 3 Tool Sharpeners serve the cutting tools for a host of Heald Bore-Matics and other precision finishing machines throughout the plant.

By replacing obsolete offhand grinding methods with *machine precision*, any required tool shape can be exactly duplicated again and again. More precisely ground and *sharper* tools not only last longer — they enable you to get top precision and full production from your Heald Bore-Matics, too. After all, it's the *tool* that does the *work!* For complete information, send for Bulletin No. 2-4-2, Issue 1.

IT PAYS TO COME TO HEALD

THE **HEALD** MACHINE COMPANY
Worcester 6, Massachusetts
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HEALD

American Machinist

McGRAW-HILL MAGAZINE

METALWORKING PRODUCTION

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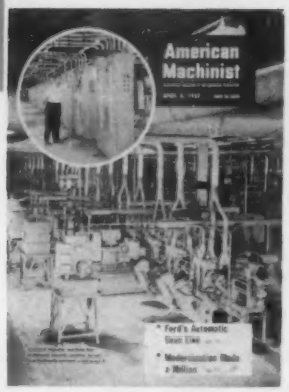

Cover . . .
Cylinder-head line at the Chrysler engine plant in Windsor, Ontario. This line is made up of W F & John Barnes units, each of which has individual electrical controls (inset) and hydraulic systems. With the Electro-Graphic detector system, downtime for maintenance is said to be reduced as much as 90%.

Automatic Factory? . . . When we described the automatic bearing line in a Moscow plant as "Russia's Automatic Factory" (*AM*—Jan 14 '57, p147), we knew that there were several lines in this country with about the same degree of automation. Some of these are bearing lines and some are gear lines—because the handling methods can be rather similar for these two items.

The earliest example of an automatic pinion line in the US was the Buick line. We told that story first (*AM*—Aug 1 '55, p111) in "Gears Untouched by Human Hands." Similar lines have since been established in other plants.

Recently we learned of a series of four lines at Ford that will involve a number of new developments. George De Groat, our Detroit Editor, went to work on the job immediately. The first line is now in operation and you'll find the story of how it is set up starting on page 154. When you read it, look for such developments as the crippled track and the anti-coincidence device.

Nothing makes us happier than to see a plant that is suffering from that rundown feeling make a comeback. And such a comeback sparkles most when the job is done without outside pushing. American Bosch today presents such a rags-to-riches story as the result of a self-generated modernization program. Associate Editor "Bill" Stocker went through the new program with the people who did the work, step by step. As a man who knew the original picture, Bill says it's one of the best examples of money well spent that he has seen in a long time. You will find our before-and-after Special Report not only inspiring but full of ideas you will be anxious to try yourself. Page 129.

Coming . . . *AM* for April 22 heralds the approach of hot weather with a dollars and cents case history of air conditioning in a plant of moderate size. You'll find the first of the series on modern management for the small plant that will spell out the details of the ideas outlined in our recent Special Report (*AM*—Feb 25 '57, p129). We salute the Materials Handling Show with a study on safe loads for crane lifts and bring you (in the same breath) two good die design articles. Elsewhere in this packed issue we will report experiences with shell blasting, coated abrasives, and dielectric heat. All this should bring you out of that post-income-tax torpor.

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A complete gear for a fifth of a gear!

It all depends on the gear, of course. But, by the time an earlier model generator has cut one-fifth of a gear, the new No. 104 Straight Bevel Coniflex* Generator has *completed* a similar gear!

You can increase your production by as much as 400% with this new Gleason machine. You can get these results because this generator has two interlocking disc-type cutters with twenty-four blades each. These cutters complete a gear in *one rapid operation!*

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Write us and we will be pleased to send you a bulletin and further information on the new No. 104 Straight Bevel Coniflex Generator.

The No. 104 Straight Bevel Coniflex Generator completes gears up to 8½" diameter and 1⅜" face width, and from 20 to 3 DP.

*Coniflex® straight bevel gears with localized tooth bearing.

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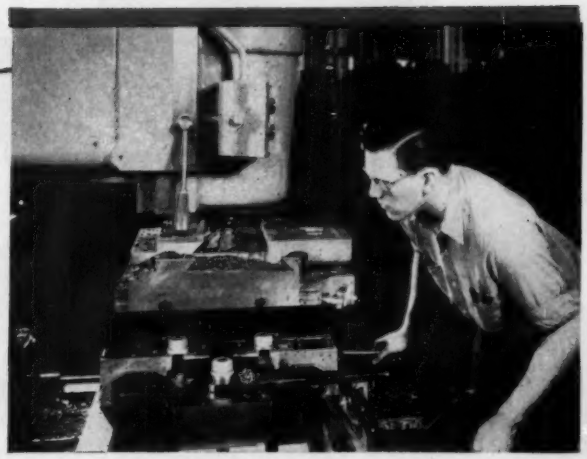
Milling the T-slot. Cincinnati Rear Controls and Power Drawbar are exceptionally useful features of convenience for this operation.

Cincinnati Power

the new push-button

At the touch of a button, cutters are tightened and released in the ...achine spindle.

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES



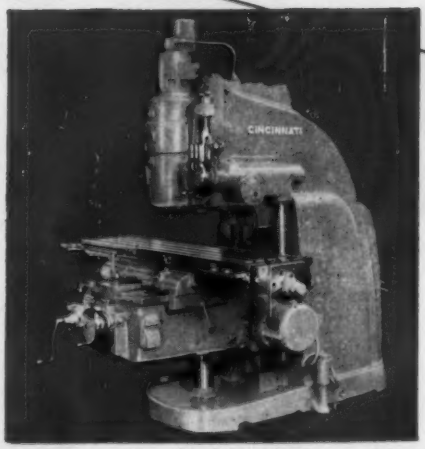
Dovetail milling operation. This cutter is one of several required for 14 different milling cuts in one setting of the work.

Drawbar Attachment

way to frequently change cutters

Small lots of parts requiring a number of milling operations always present a knotty problem. There are two solutions: leave the work in the fixture and change cutters for each operation, or leave the cutter in the machine and remove the work after performing one operation at a time, and reset for the next operation. You can solve this problem once and for all with CINCINNATI Milling Machines equipped with Power Drawbar Attachment. Then for multiple operation work, changing cutters becomes a simple push-button chore. Push one button and the arbor is tight in the machine spindle; push another button and the arbor is released. A few seconds' time does it! ¶ The illustrations show the Power Drawbar unit on a CINCINNATI® No. 3 Vertical Dual Power Dial Type Milling Machine. Of course the machine itself is the big factor in reducing the cost of a variety of milling operations. It has 24 spindle speeds 16 to 1600 rpm; 32 feeds ⅜ to 90 ipm; power speed and feed selection with a single lever; automatic backlash eliminator; automatic table feed cycles; power feed to vertical head, and 22 additional advantages outlined in the catalog. Want a copy? Ask for publication M-1917-3. Brief specs in Sweet's.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI Vertical Dual Power Dial Type Milling Machine equipped with Power Drawbar Attachment. Catalog M-1917-3.

Brief Specs, *Vertical High Power and Dual Power Dial Type Milling Machine

Size	No. 2	No. 3	No. 4	No. 5	No. 6
Range: longitudinal	28"	34"	42"	50"	60"
cross	14"	16"	18"	18"	18"
vertical	14"	16"	16"	16"	16"
vertical head	6"	7"	8"	8"	8"
24 spindle speeds	16 to 1600 rpm		14 to 1400 rpm		
32 feeds	⅜ to 90 ipm		⅜ to 90 ipm		
Main motor: High Power	15 hp	20 hp	25 hp	25 hp	25 hp
Dual Power	20 hp	30 hp	50 hp	50 hp	50 hp

*Cincinnati also builds Plain Machines Nos. 2 to 6 sizes, and Universal Machines, Nos. 2 to 5 sizes.

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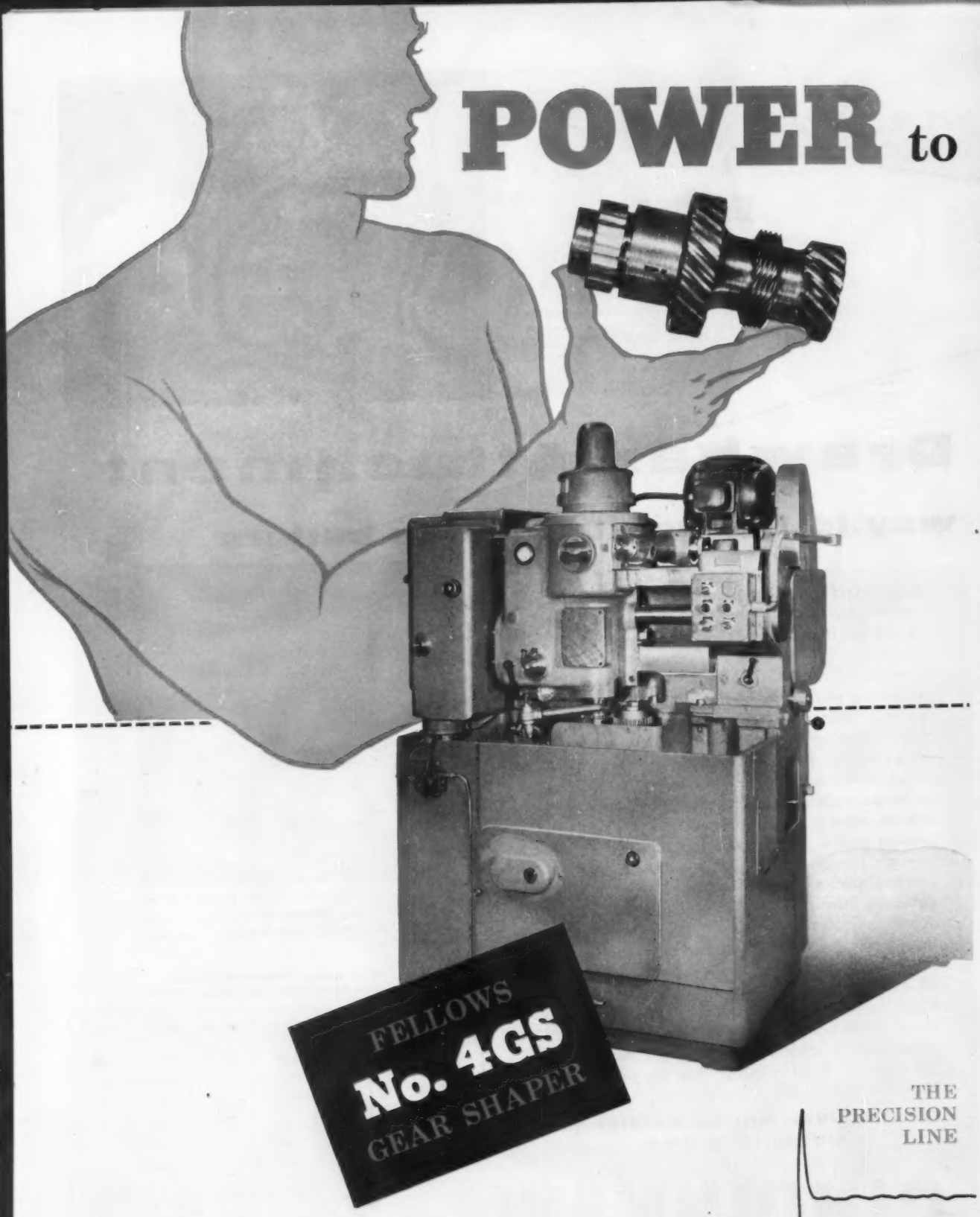
HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

POWER to



THE
PRECISION
LINE

Lower Gear Production Costs

Performance figures of Fellows No. 4GS Gear Shapers on many production lines prove that these high speed machines pay "profits" in lowered costs everywhere they're used. One major manufacturer has installed 10 new No. 4GS Gear Shapers because each cuts 30% faster than his older machines, saves in set-up time, too.

The new Fellows No. 4GS Gear Shaper finish-cuts internal and external spurs and helicals up to 6" P.D. and 2" face width, at 9 cutter speeds from 98 to 635 strokes per minute. Rigid mechanism assures close tolerances at all speeds. For large production runs, it can be readily adapted to operate semi-automatically or completely automatically. And the versatility of the No. 4GS Gear Shaper permits fast, efficient cutting of a nearly infinite variety of cams, splines and special contours.

For full information about the complete Precision Line of Fellows Gear Production and Inspection Equipment, get in touch with your Fellows representative. Write, wire or phone any Fellows office.

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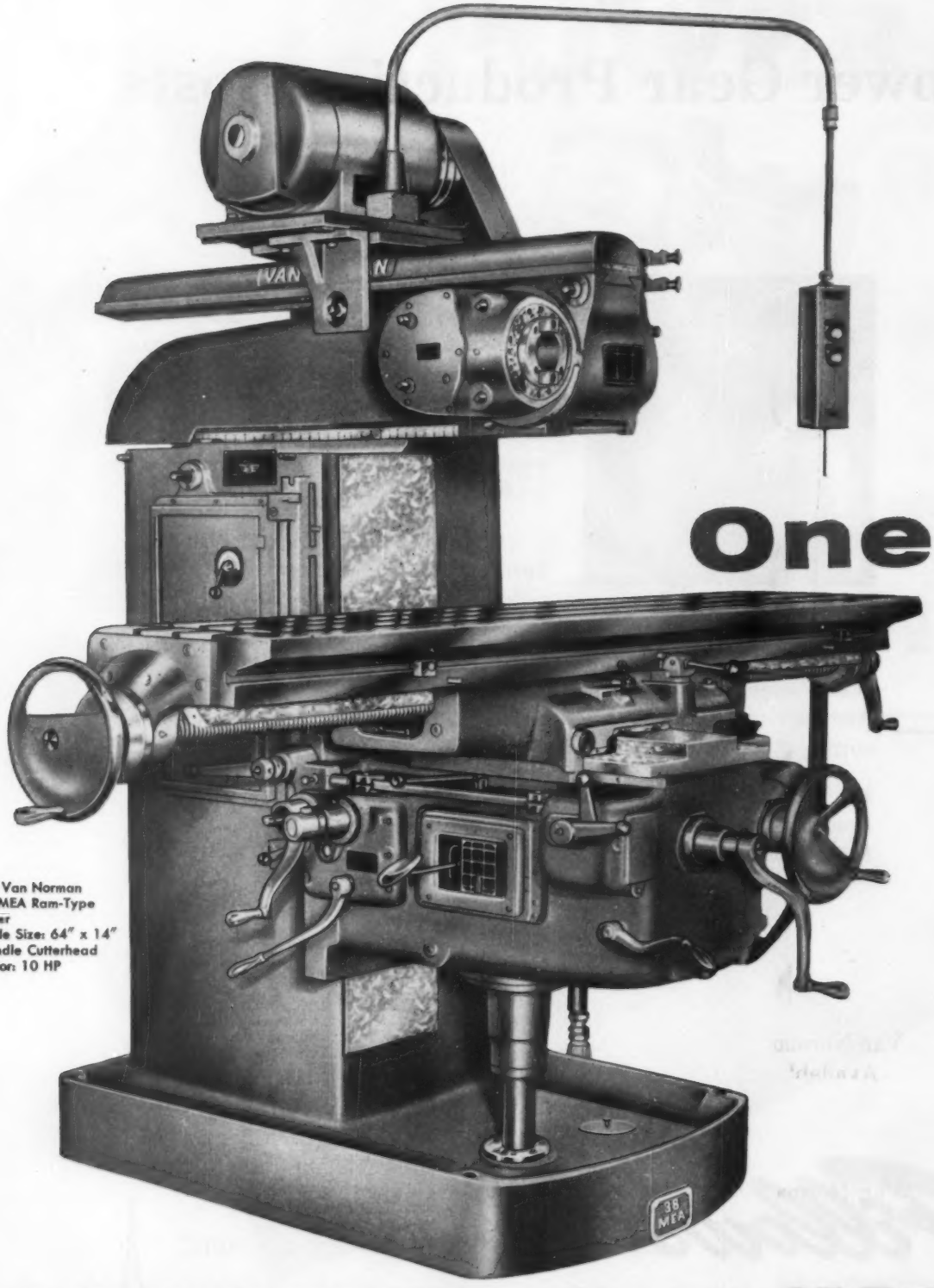
Fellows *Gear Production Equipment*



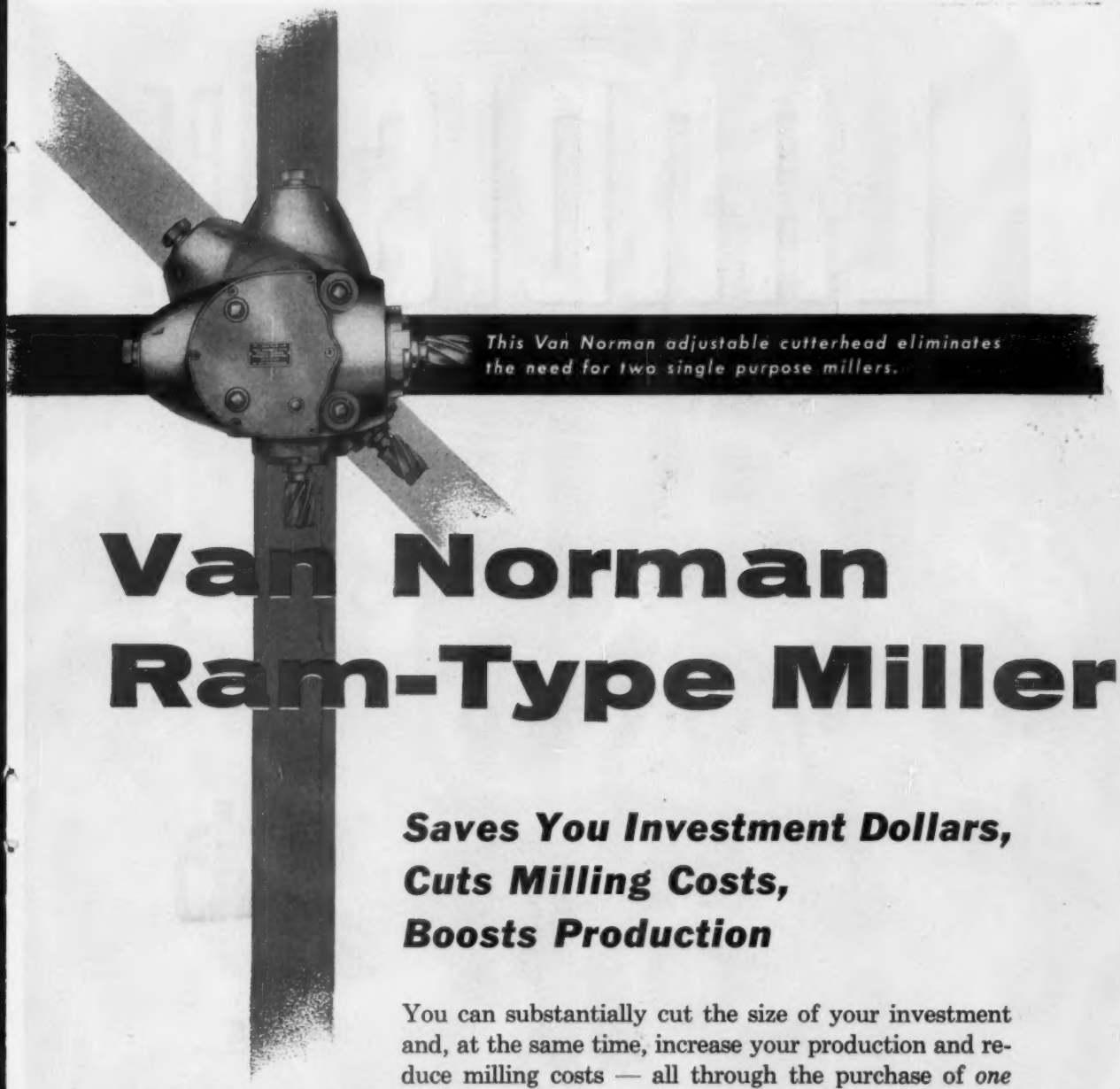
One

The Van Norman
38 MEA Ram-Type
Miller
Table Size: 64" x 14"
Spindle Cutterhead
Motor: 10 HP

VAN NORMAN MACHINE

A DIVISION OF VAN NORMAN INDUSTRIES, INC.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



This Van Norman adjustable cutterhead eliminates the need for two single purpose millers.

Van Norman Ram-Type Miller

Saves You Investment Dollars, Cuts Milling Costs, Boosts Production

You can substantially cut the size of your investment and, at the same time, increase your production and reduce milling costs — all through the purchase of *one* Van Norman Ram-Type Miller.

Available for all types of work, Van Norman Ram-Type Millers permit horizontal, vertical and angular milling without attachment — they reduce idle machine and operator time.

Get complete details on the Van Norman 38 MEA, or on any of the many Van Norman Ram-Type Millers. Write, wire or telephone for catalog.

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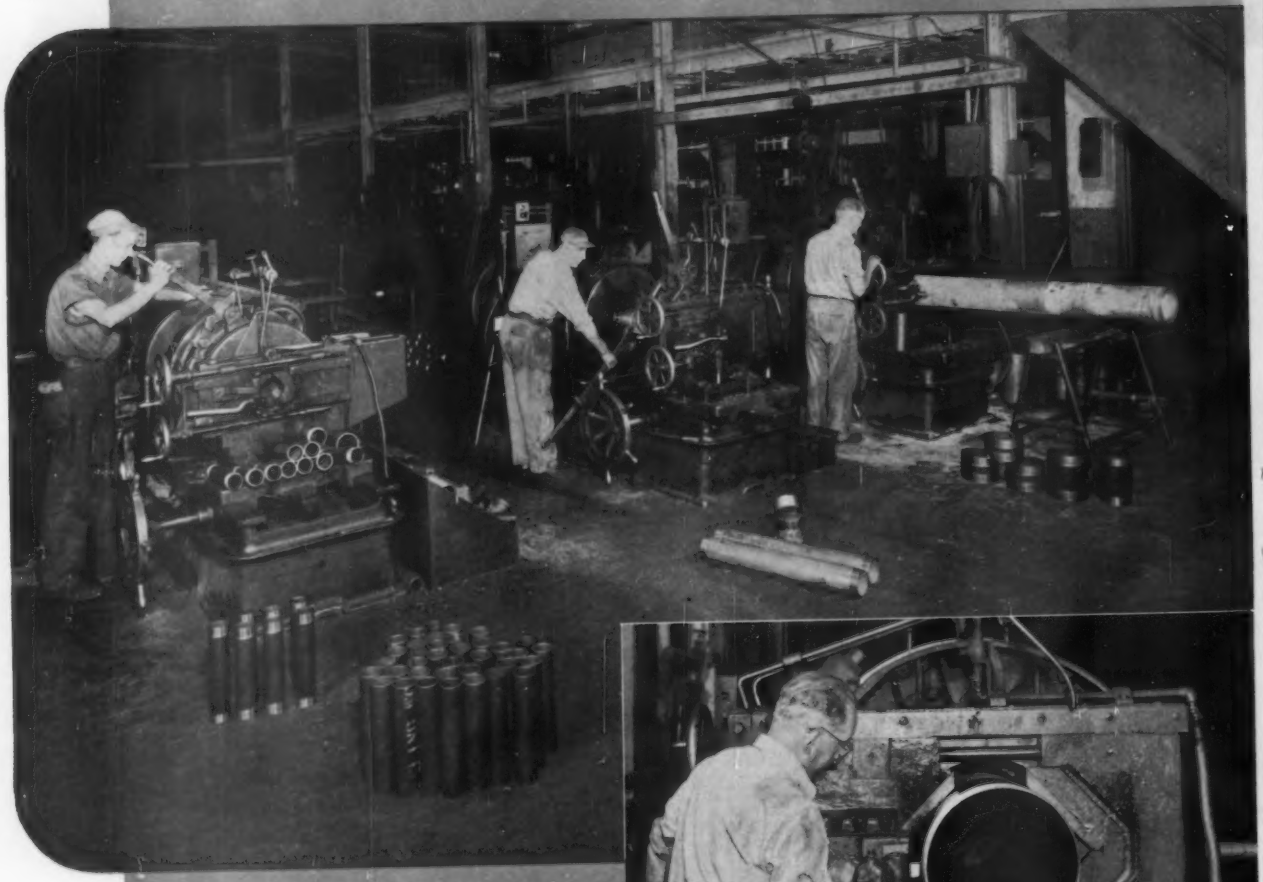
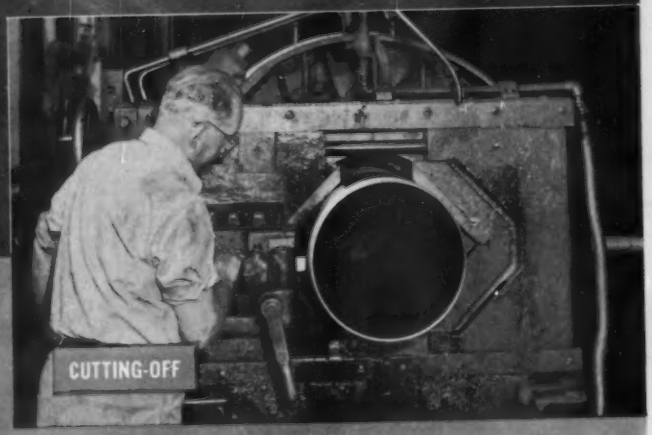
Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.

LANDIS PIPE ...Four





● *Illustrations feature operations of an installation of LANDIS Pipe Machines in a large Detroit Plant.*

LANDIS

LANDIS Machine

. . . THE WORLD'S LARGEST EXCLUSIVE

THREADING MACHINES

Major Features Increase Efficiency

1. WIDE RANGE

Just three LANDIS Pipe Machines (2", 8" and 18") will thread all diameters of pipe from ½" to 18". Each machine is constructed so as to handle a wide range of pipe sizes—for example, the 6" machine will thread all diameters from 1" to 6". Universal size adjustment allows quick set-up.

2. DIE HEAD EFFICIENCY

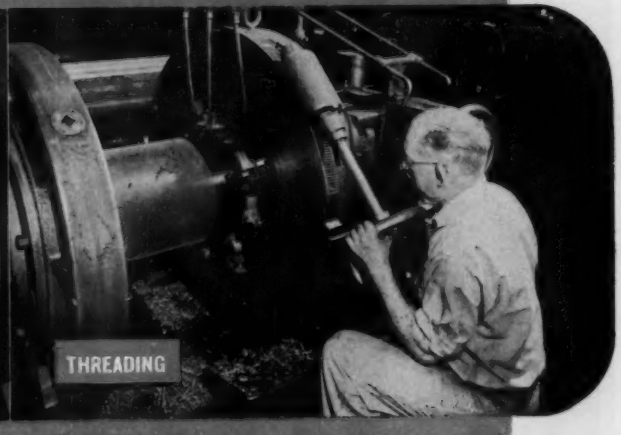
The design of Stationary heads provides maximum rigidity on all diameters within their range. Positive locking action is assured through a self-locking toggle joint. Size adjustment is quickly and easily obtained through use of a single locking nut.

3. LOW TOOL COST

Chasers operate at a tangent to the work. Line contact at cutting edge reduces friction. Permanent throat assures even chip distribution. Variable rake affords proper cutting edge for different materials. Landis chasers are useable for 80% of their original length. They are individually replaceable and, within the range of a given die head, a single set of Landis chasers can be used for all diameters of the same pitch, form and taper.

4. PRECISION TAPERED THREADS

The Receding Chaser Pipe Machines are especially designed to cut tapered threads to meet A.P.I. requirements. Chasers recede into the die head at a rate equal to the taper of the thread, ensuring accurate and uniform taper along the full thread length.



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New Landis wide wheel heavy duty grinder

. . . on these jobs

1. **Profile grinding**
2. **Wide wheel infeed grinding . . .** makes one operation of jobs formerly requiring two or more
3. **Spaced wheels infeed grinding . . .** finishes several diameters at one time

Landis 10" x 18" Type DCH Plain Hydraulic Grinder
Standard Wheel Sizes: 24"x10", 30"x9", 36"x5"

LANDIS
precision grinders

Landis type DCH plain grinder design features
Heavy duty wheel spindle and microsphere bearings
20 hp wheel drive motor
10" or 14" machine swing
1½ hp work drive motor

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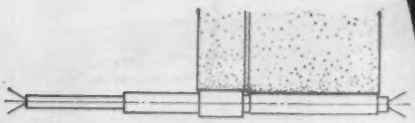
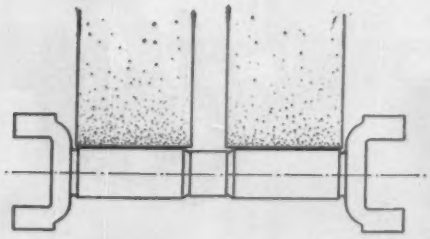
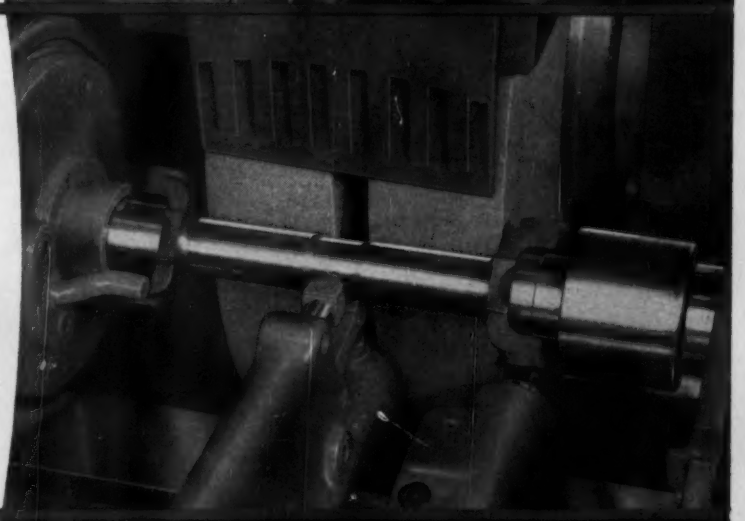
combines operations, lowers costs

Profile grinding two diameters of a motor shaft in one operation using an 8" wide wheel.

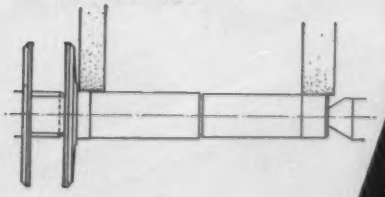


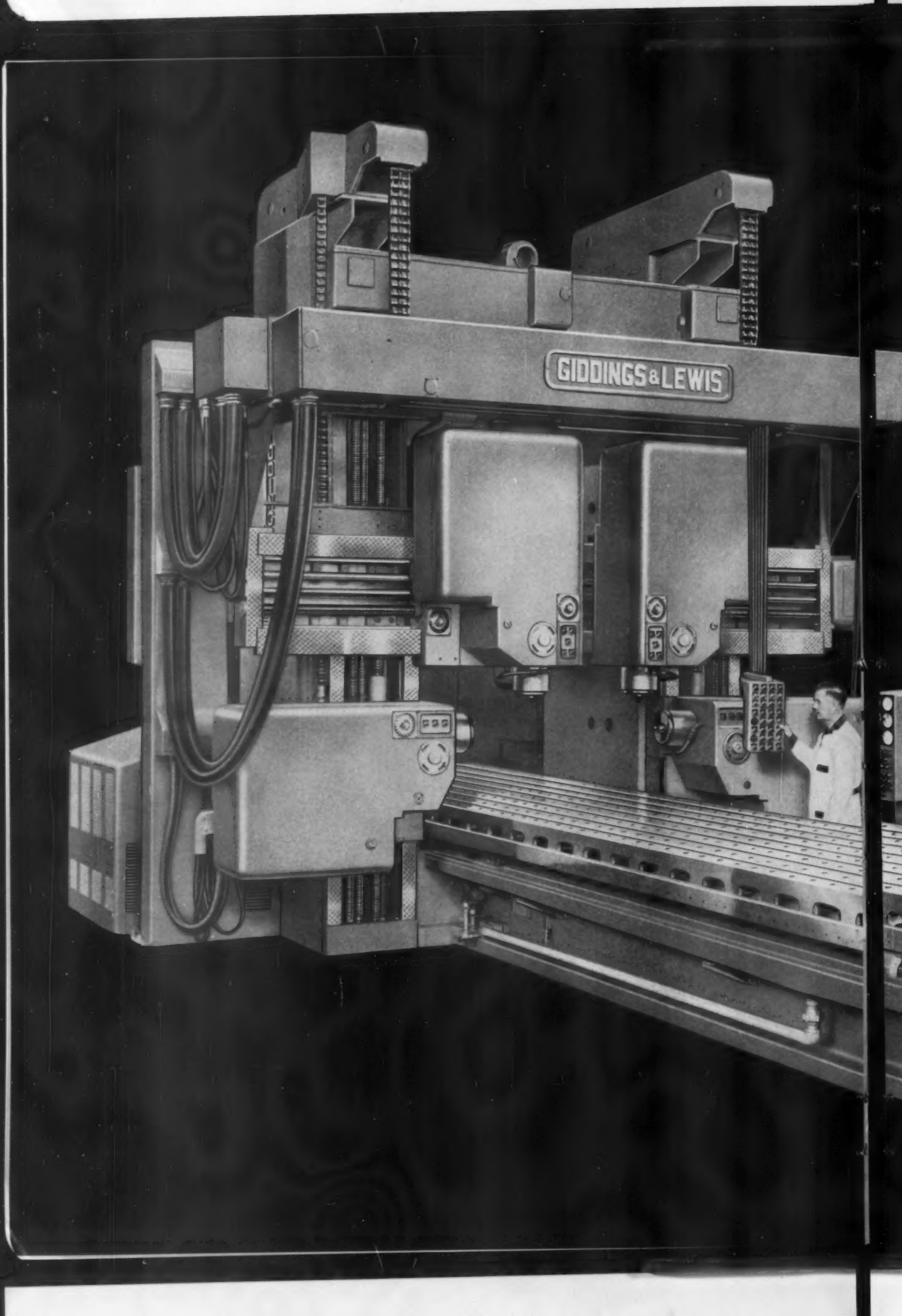
Infeed grinding diameters of propeller shaft sleeve yokes on one arbor. Multiple table-type diamond dressing.





Widely spaced wheels finish two diameters and one adjoining face of transmission output shaft.




GIDDINGS & LEWIS

Giddings & Lewis high-speed 10-inch quill HYPRO PLANER-MILLERS

You get *power* plus *ultra-precision* milling with four 50-hp water-cooled head motors . . . *proven design* features . . . *advanced engineering* in the revolutionary G&L 10-inch quill HYPRO planer-type milling machine. Outstanding features that assure *greater productivity* are:

HYDRAULIC COUNTERBALANCE SYSTEM for removing the *entire* weight of the rail milling heads from the rail. This system permits maximum rail accuracy for finishing cuts since relative position of the rail heads on the rail does not influence rail level.

WATER-COOLED HEAD MOTORS assuring ample power for high metal removal while maintaining proper operating temperatures. Bulky, clumsy, off-balance head design eliminated.

SIMPLIFIED MACHINE CONTROL SYSTEM immediately noticeable by the almost *complete* absence of manual controls. Customary time consuming levers, handles and wrenches excluded.

NEW FEED RAIL ARRANGEMENT eliminating tangled unsightly customary hose and cable services to milling heads.

EXTRAORDINARY HYDRAULIC CLAMPING MECHANISMS providing maximum machine rigidity for full power, heavy-duty, rough machining operations.

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For more information on G&L 10-inch quill HYPRO planer-millers, contact your nearest Giddings & Lewis representative, or write direct.

LITERATURE AVAILABLE:
For complete specifications on G&L HYPRO quill-type planer-millers, write for Bulletin No. 108.

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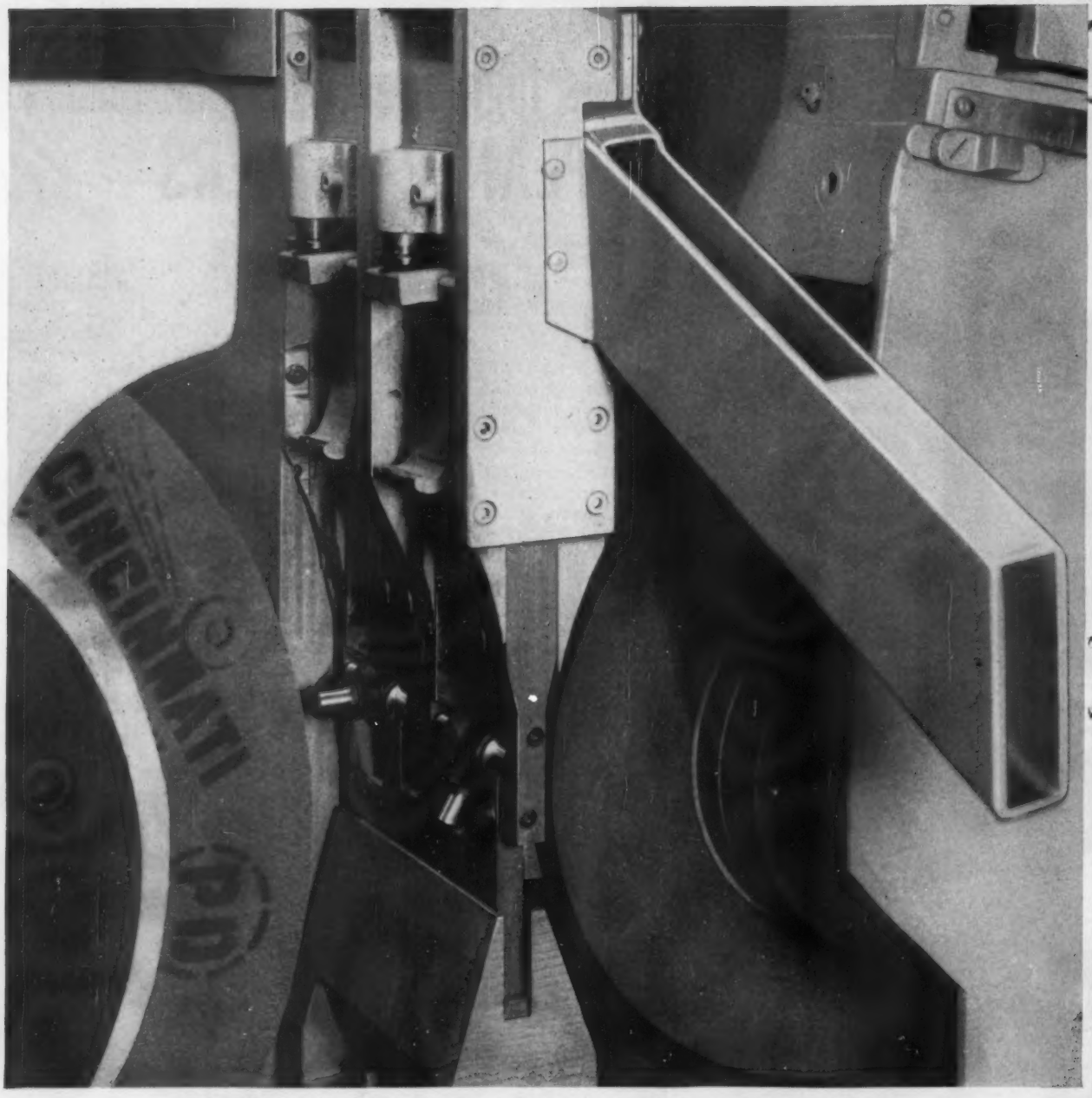
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-75

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

Cincinnati Filmatic



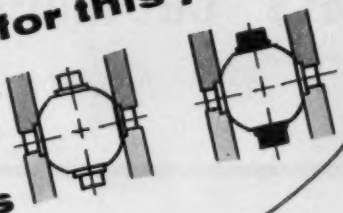
Universal joint spiders are automatically centerless ground on four pin diameters at the rate of **300 parts per hour.** The machine is a **CINCINNATI FILMATIC No. 2 Centerless,** completely tooled up for production.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

Nos. 0 2 3 4 5 6 Centerless

The No. 2 is the machine for this job ...grinding pin diameters on universal joint spiders



FILMATIC

Unusual applications are the usual day's work for Cincinnati centerless grinding specialists. In the example illustrated here these men devised a way to automatically grind two pin diameters on each of two universal joint spiders at the same time. The No. 2, one of six sizes of fine CINCINNATI® FILMATIC Centerless Grinding Machines, was selected for the job. ¶ A unique transfer mechanism, incorporated in the loading fixture developed by Cincinnati for the machine, was the key to this low-cost method of production. To advance from one grinding station and set of wheels to the next, the transfer mechanism, during the retraction segment of the grinding cycle, simply takes the part from the first station, swings it 90°, orienting it and depositing it on the loading fingers for the second operation. In this manner, four diameters and adjacent radii are ground each cycle, at the rate of 300 completed parts per hour. Equipment includes automatic profile truing for the grinding wheel and electro-hydraulic automatic infeed attachment. ¶ Every shop concerned with precision cylindrical grinding can profit from the experience of Cincinnati grinding and automation specialists. You can be sure that these men will give you the benefit of the most advanced thinking in centerless grinding methods, supported by 33 years' experience. May we hear from you?

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

CINCINNATI FILMATIC No. 2 Centerless Grinder, equipped to automatically grind universal joint spiders. You will find brief information on the standard No. 2 machine in Sweet's. For complete data write for catalog No. G-644-2.

GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Spindle grinding job demonstrates how Norton Swivalign* Indicator beats "cut-and-try" method

THE JOB Finish grinding bearings and tapers on grinding wheel spindles.

THE PROBLEM Reduce grinding time and costs.

THE SOLUTION: The use of Norton's SWIVALIGN dual-electric indicator to measure swivel table adjustment in setting up the grinder.

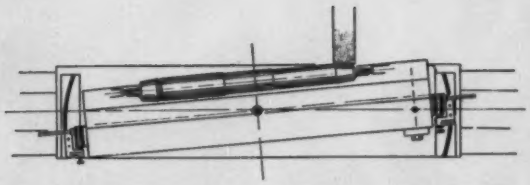
Here is another Norton forward step in the teamwork between man and machine.

The man sets the indicator . . . the SWIVALIGN device permits him to put the work in line more accurately than the human eye could see.

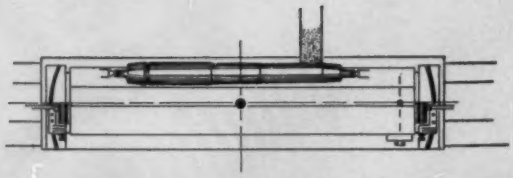
There were two savings here: First, the tedious time consuming work of the cut-and-try method was eliminated entirely; second, the grinding time for this job was reduced a full 15%. It's just another demonstration of the *every-time* cut in hours and work by use of the Norton SWIVALIGN Indicator.

FOR INFORMATION on the Norton SWIVALIGN Indicator and on its application to Norton universal and cylindrical grinders, see your Norton Representative, or write direct. And remember, only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Company, Ltd., Toronto 5.

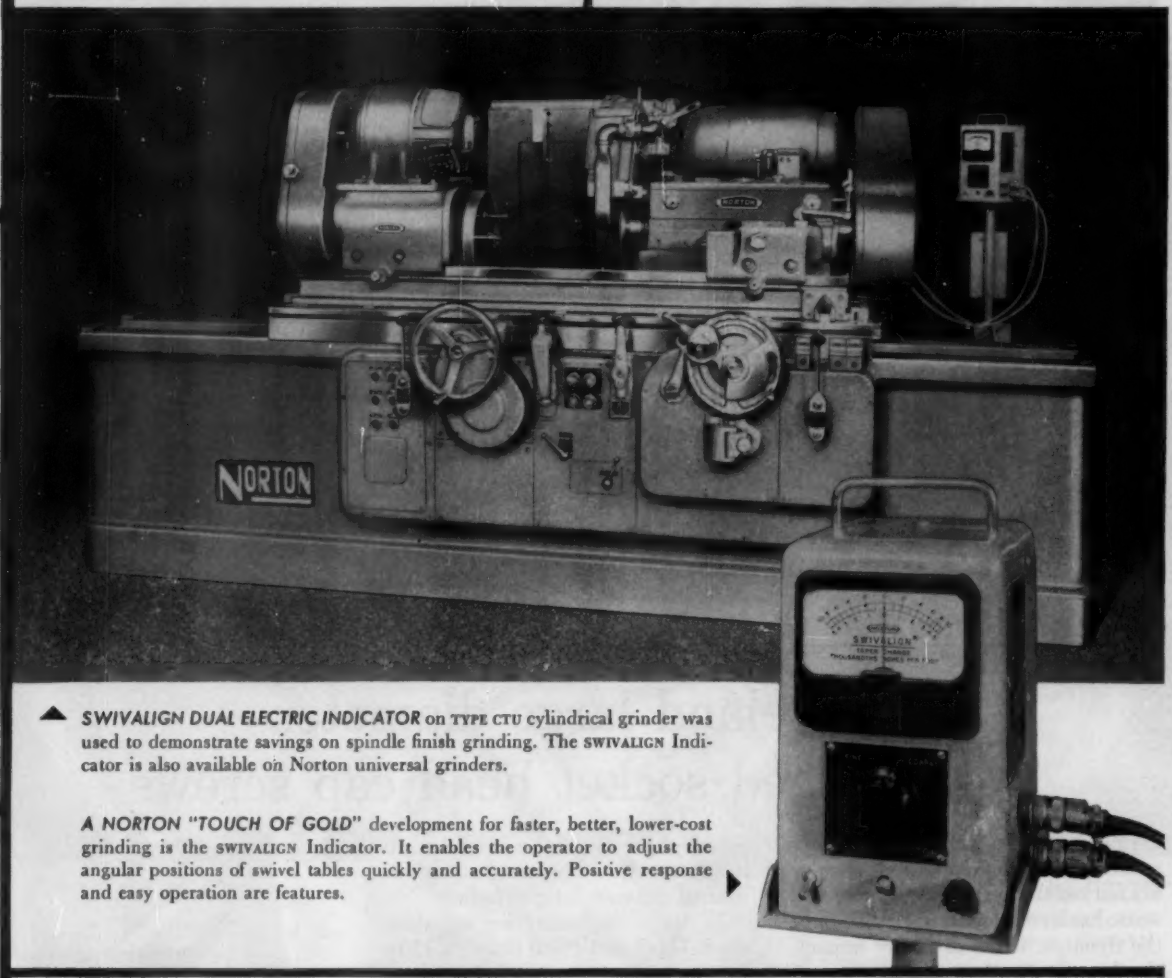
*Trade-Mark



GRINDING SPINDLE TAPER ENDS went more quickly and cost less when a Norton SWIVALIGN device was used to set the table at the correct angle to grind.



BEARING DIAMETERS of the spindle quickly moved into correct position for grinding . . . SWIVALIGN unit proved vastly superior to old "cut-and-try" method.



▲ ***SWIVALIGN DUAL ELECTRIC INDICATOR*** on TYPE CTU cylindrical grinder was used to demonstrate savings on spindle finish grinding. The SWIVALIGN Indicator is also available on Norton universal grinders.

A NORTON "TOUCH OF GOLD" development for faster, better, lower-cost grinding is the SWIVALIGN Indicator. It enables the operator to adjust the angular positions of swivel tables quickly and accurately. Positive response and easy operation are features. ▶

To Economize, Modernize with **NEW**

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

District Offices: Worcester • Hartford
Cleveland • Chicago • Detroit

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes

BRUTE STRENGTH FOR BIG ASSEMBLIES—

Cleveland large diameter upset forged socket head cap screws

On big presses, extrusion machinery, and earth moving equipment, fasteners not only have to support massive static loads; they must also withstand the dynamic stress of heavy impact, shock and vibration.

Engineered specifically for this type of service, Cleveland large diameter socket head cap screws are upset forged from specially heat-treated alloy steel. The forging process shapes the steel so that grain flow follows the contour of the head; eliminates planes of weakness along which shear might occur under dynamic stress; and protects assemblies against fastener fatigue failure.

In large diameters we regularly stock 1¼-7 and 1½-6 through 12 in. for same-day shipment. For other standard sizes from 1⅛ to 3 in. diameter through 12 in. length, we have the stock and the tooling to produce your order quickly.* For prompt service, contact your local Cleveland distributor. He can also supply large diameter upset forged hexagon head cap screws.

*Diameters over 3 in., lengths over 12 in., available on special order.

New folder gives dimensions (including old and new head details), physical properties, weights, prices of Cleveland large diameter socket head cap screws. Write for copy today.

THE CLEVELAND CAP SCREW COMPANY

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Assures Maximum Safety . . . Low Operating Costs

FAST CUTS
Corrugations speed the grinding of large area work or thin parts without burning.

FINE FINISHES
For light stock removal smooth face discs give quality finishes and close tolerances.

FULL VALUE
The entire rated thickness of the abrasive is usable.

WIRE-LOKT® SAFETY
Heavy steel mesh securely imbedded in the abrasive assures maximum safety.

117A

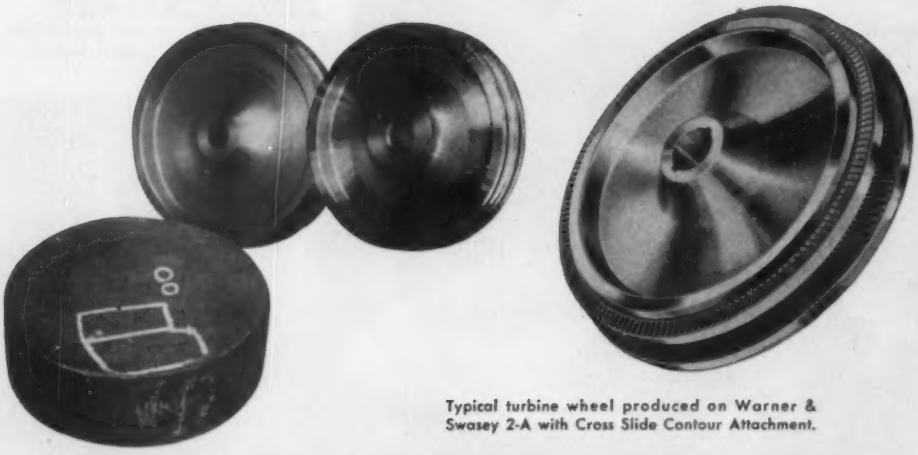
Gardner Abrasive Specialists give you the advantages of long experience gained from making *both* grinding machine and abrasive discs. Individual specifications will be developed to handle *your* particular grinding job.

GARDNER

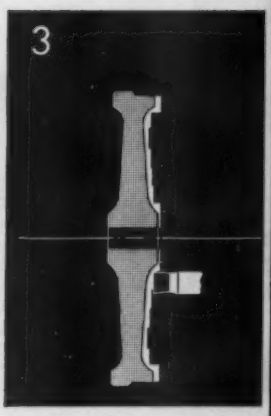
abrasive discs

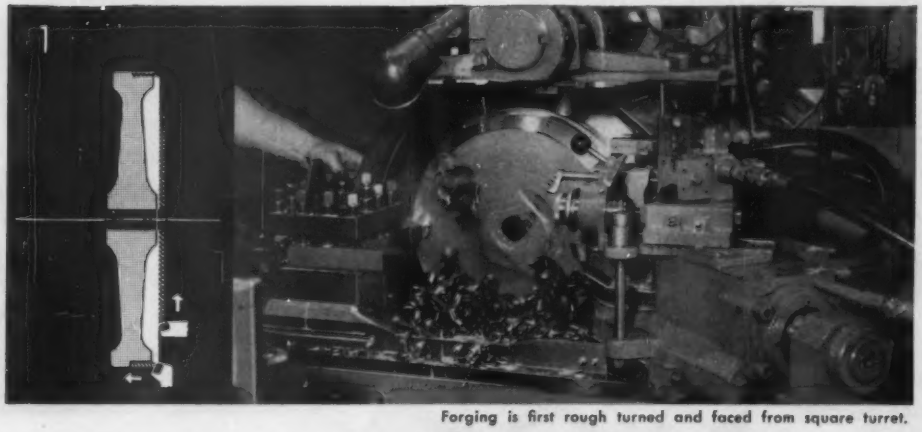
BELOIT, WISCONSIN

Ability of Warner & Swasey 2-A Contour solves turbine wheel face contouring

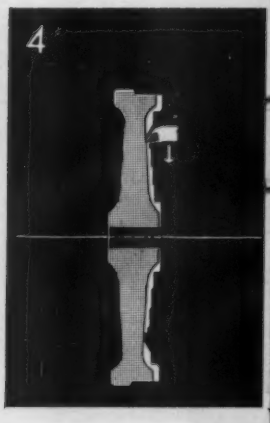


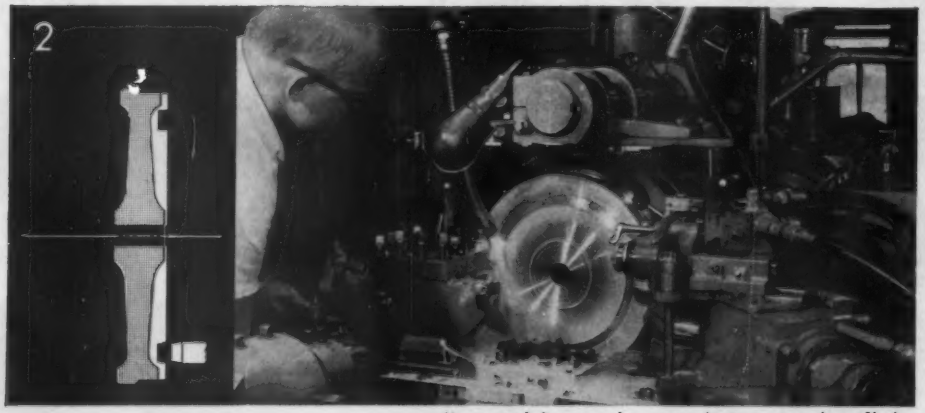
Typical turbine wheel produced on Warner & Swasey 2-A with Cross Slide Contour Attachment.



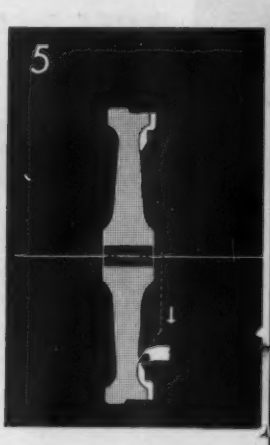


Forging is first rough turned and faced from square turret.

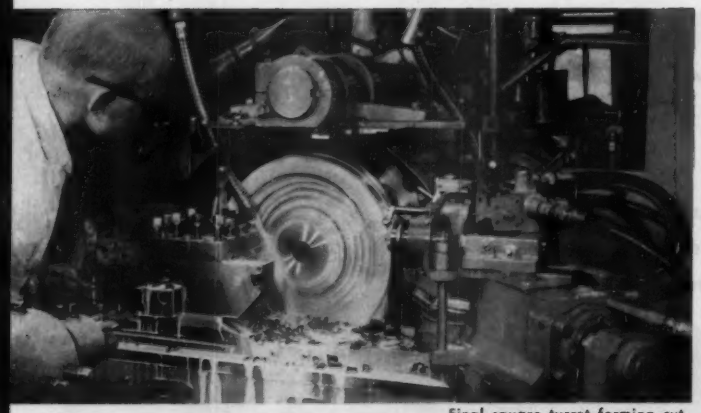




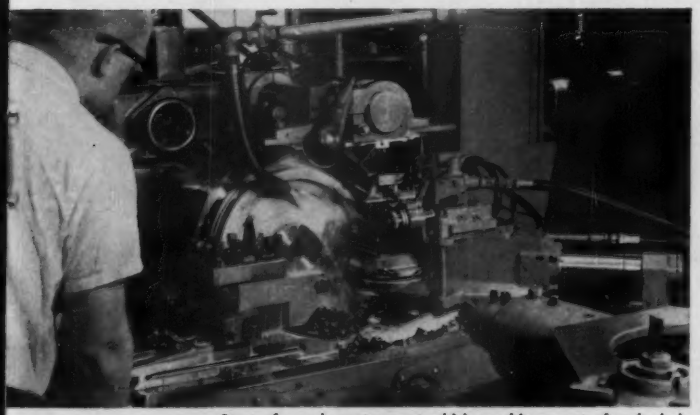
Heavy stock is removed to approximate taper web profile by this first of five concentric form cuts from the square turret.



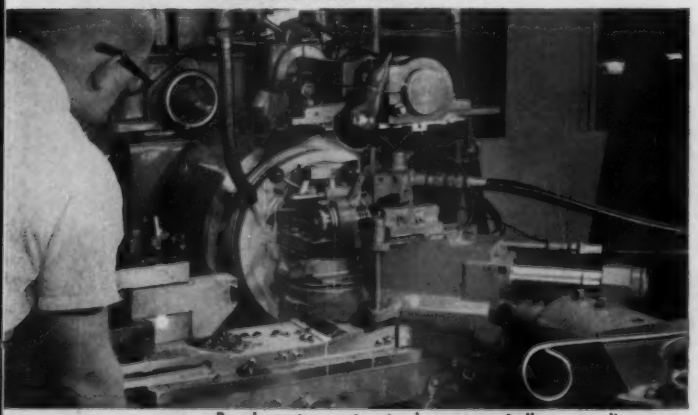
Unit to machine across center line... problem for Schellens-True Corporation



Final square turret forming cut.



Start of rough contour cut which machines part of web, hub diameter and hub face.



Rough contour cut extends across spindle center line, completing web and internal rim diameter.

Removal of over 80 pounds of metal from each side of a 250-pound alloy steel forging in 63 minutes called for the *only* turret lathe contouring attachment available today that could face across the spindle center line to machine inaccessible areas of the wheel's profile... a versatile Warner & Swasey.

Installation of a new Warner & Swasey 2-A Universal Turret Lathe with Cross Slide Contouring Attachment by Schellens-True Corp., Ivoryton, Conn., gave them the heavy-duty metal removal and machining flexibility necessary to mass-produce, by their own unique process, the turbine wheel shown at the left.

This progressive manufacturer, like many other enthusiastic users, reports their Warner & Swasey contouring equipment provides them:

- Fast, accurate contour turning and cross center facing in one unit
- Separate roughing and finishing contour cutters
- Longer effective cutter travel of 4 inches
- Instantaneous tool slide response
- Adjustable and accessible template mounting for using either round or flat templates
- No loss of turret lathe flexibility—normal turret lathe work still easily performed

Our Field Engineering Staff is always available to discuss how Warner & Swasey products can help improve work quality and build increased profits for you. Why not call today?

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Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

No matter how many cutting tools You can get the "whole package"

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Take a close look at this set-up and you'll see these 7 tools: Center drill, cobalt drill, carbide core drill, facing and turning tool, roughing reamer, finishing reamer, tap.

One man supplied all seven tools. And he, of course, is your Morse-Franchised Distributor . . . your only source for all the varied requirements of a complete tooling job like this. And the job is protected . . . *results insured* . . . by Morse Quality in every single tool. So call in this "1-man team" today . . . he makes Morse Tooling pay *all ways.*

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.
Subsidiary of VAN NORMAN INDUSTRIES, INC.
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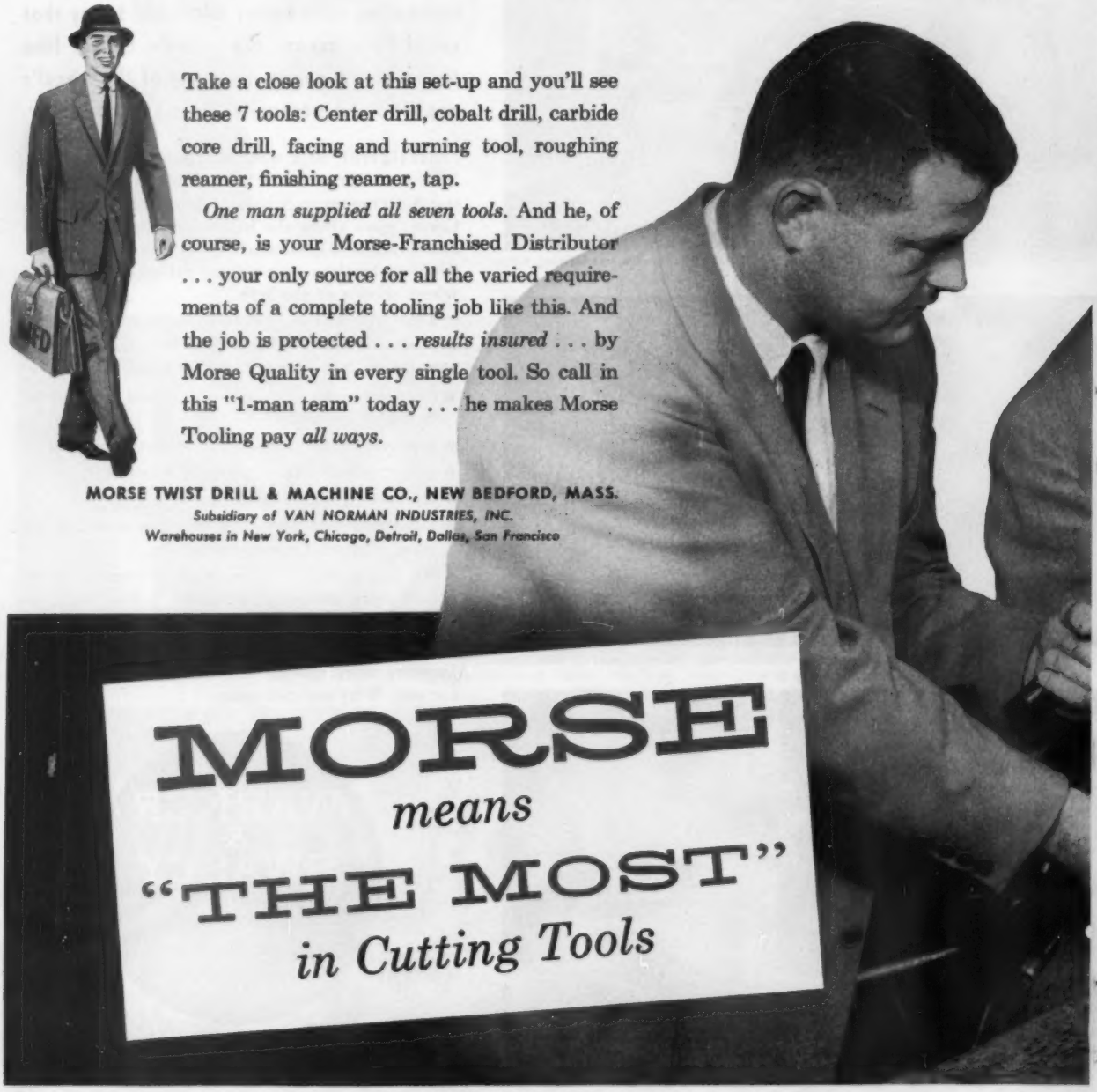

in a set-up . . .
from your
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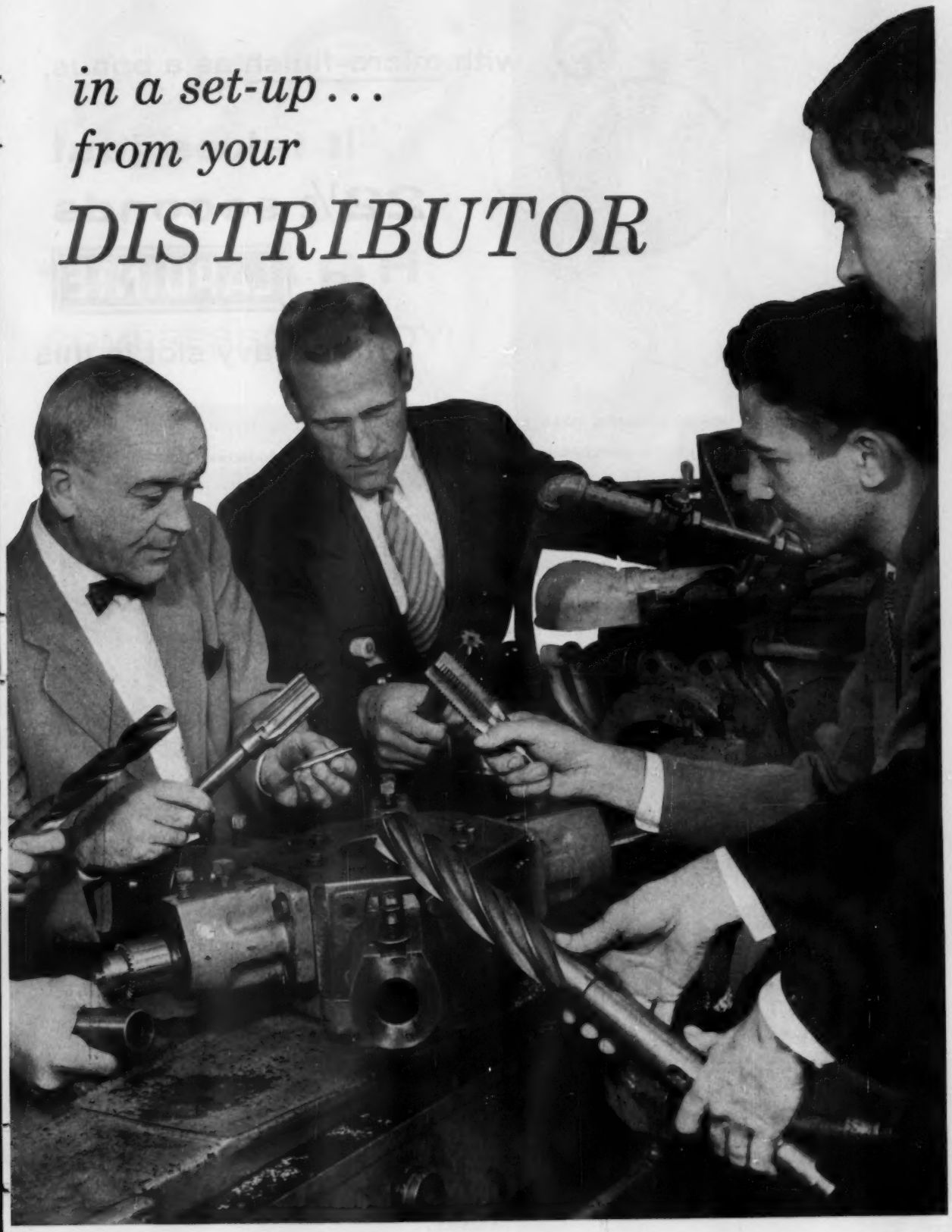
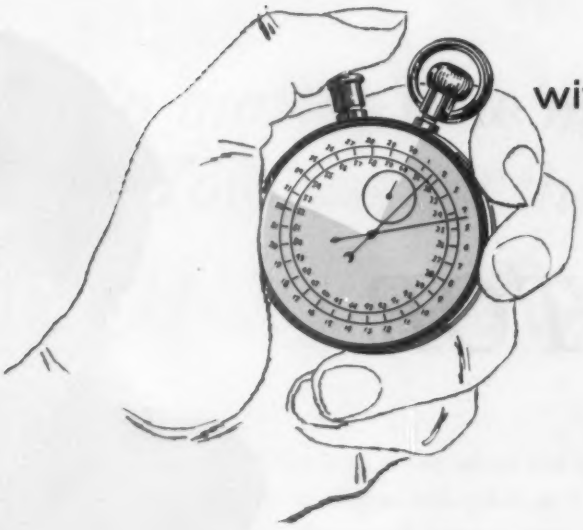




with micro-finish as a bonus,

it takes just 22½ seconds to LAPOINTE the heavy slot in this

You know how long lapping takes! By materially reducing the former lapping operation, this nationally known manufacturer of household appliances cut production time substantially . . . now they rough-and-finish broach these deep, wide (.187″) slots *in one pass* at the rapid rate of 180 per hour (at 80% efficiency).

By converting to Lapointe-Broaching, they *really* saved themselves some money! Part of the saving comes about through the use of Lapointe-Broaches, with carbide inserts. Additional saving is accomplished with the extremely efficient Lapointe-built fixtures mounted on the In-and-Out table, hydraulically operated.

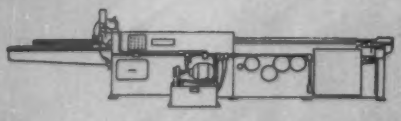
Wouldn't you like to discuss the possibility of saving money in *your* plant by Lapointe-Broaching? A well qualified Lapointe Field Engineer will call on you on request.

THE LAPOINTE MACHINE TOOL COMPANY

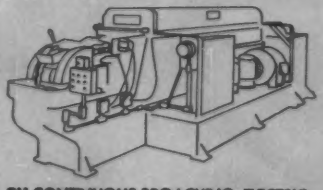
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

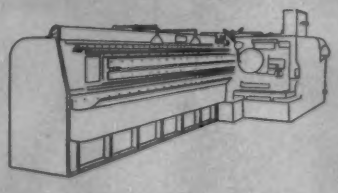
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



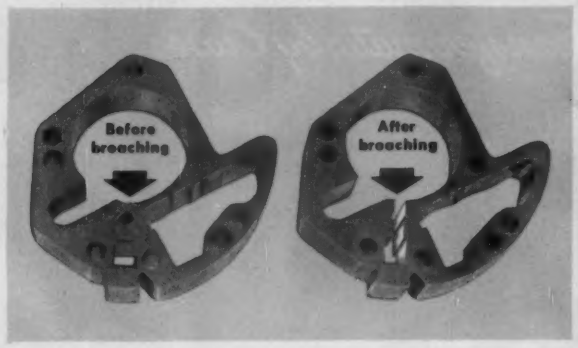
60″ STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

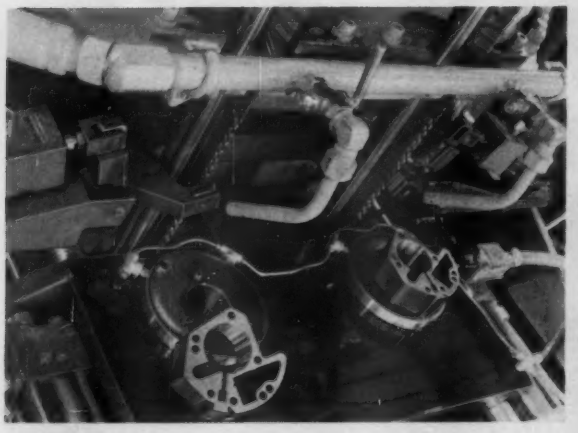


SRHE SINGLE RAM HORIZONTAL, ELECTRIC



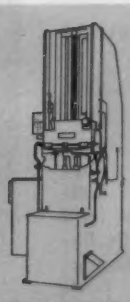
—BROACH

COMPRESSOR BODY!

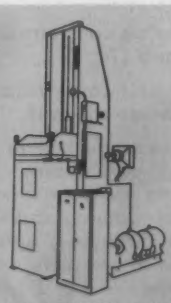


Pulling two broaches at a time, this Lapointe Vertical Pull-Down Broaching Machine (V-5, 20-ton, with special 90-inch stroke), is used for broaching these slots. Work nests have hydraulic clamping.

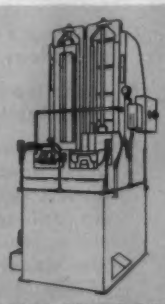
This series of Lapointe VPD Broaching Machines ranges from 5- to 50-ton capacity, 36- to 90-inch stroke.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



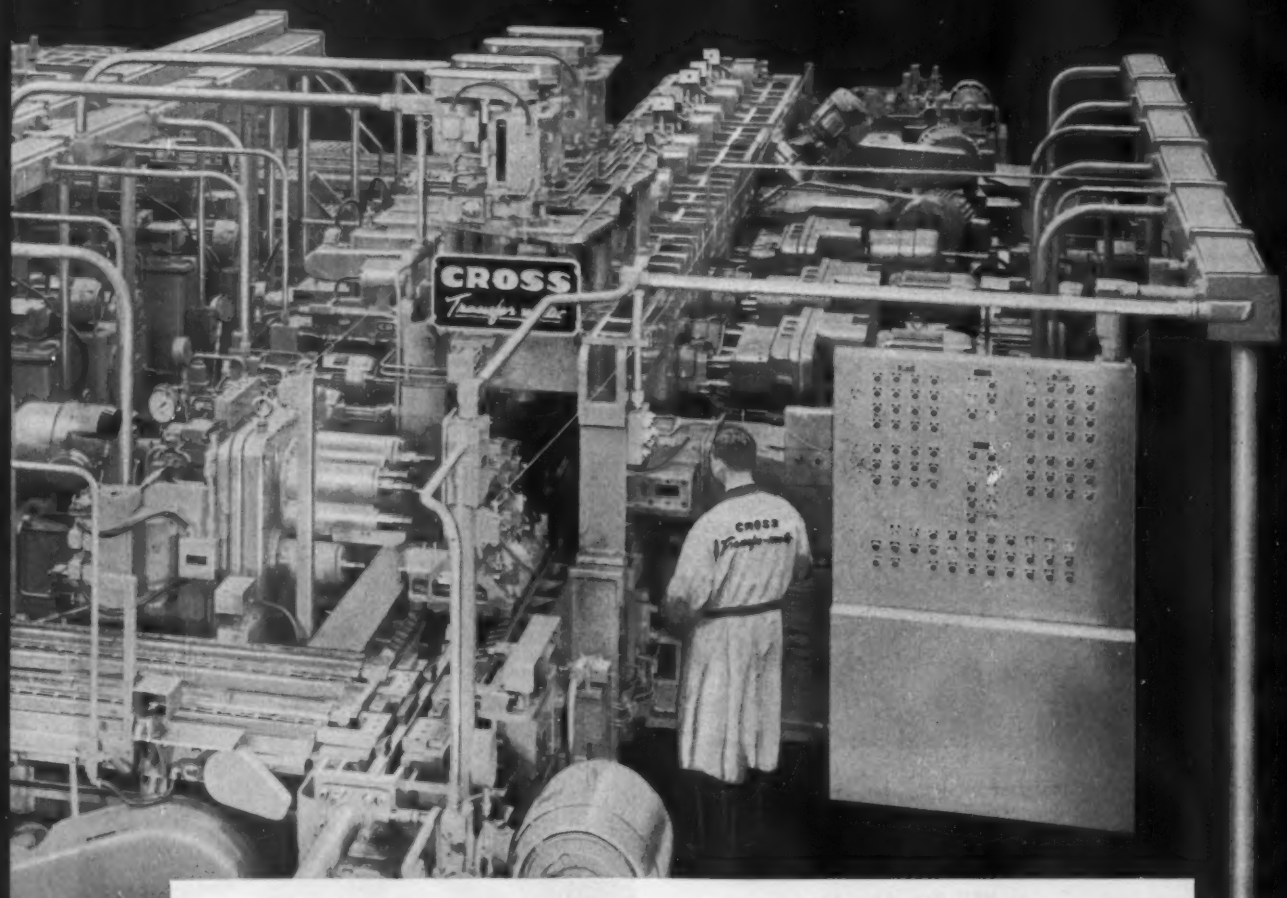
DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

Another Transfer-matic by Cross



★ Straddle mills upper and lower support arm bosses; straddle mills steering arm boss; mills steering arm stop pad; mills spindle keyway; drills and taper reams upper and lower support arm holes and steering arm hole; drills, reams, chamfers and spotfaces two brake mounting plate holes; drills, counterbores, spotfaces, chamfers and reams brake anchor hole; drills spindle cotter pin hole; and threads wheel spindle.

★ 144 right and 144 left hand parts per hour at 100% efficiency.

★ Pallet type work holding fixtures locate parts from spindle bearing diameters.

★ Power wrench clamps work holding fixtures automatically.

★ Gravity operated cam clamps for the work holding fixtures.

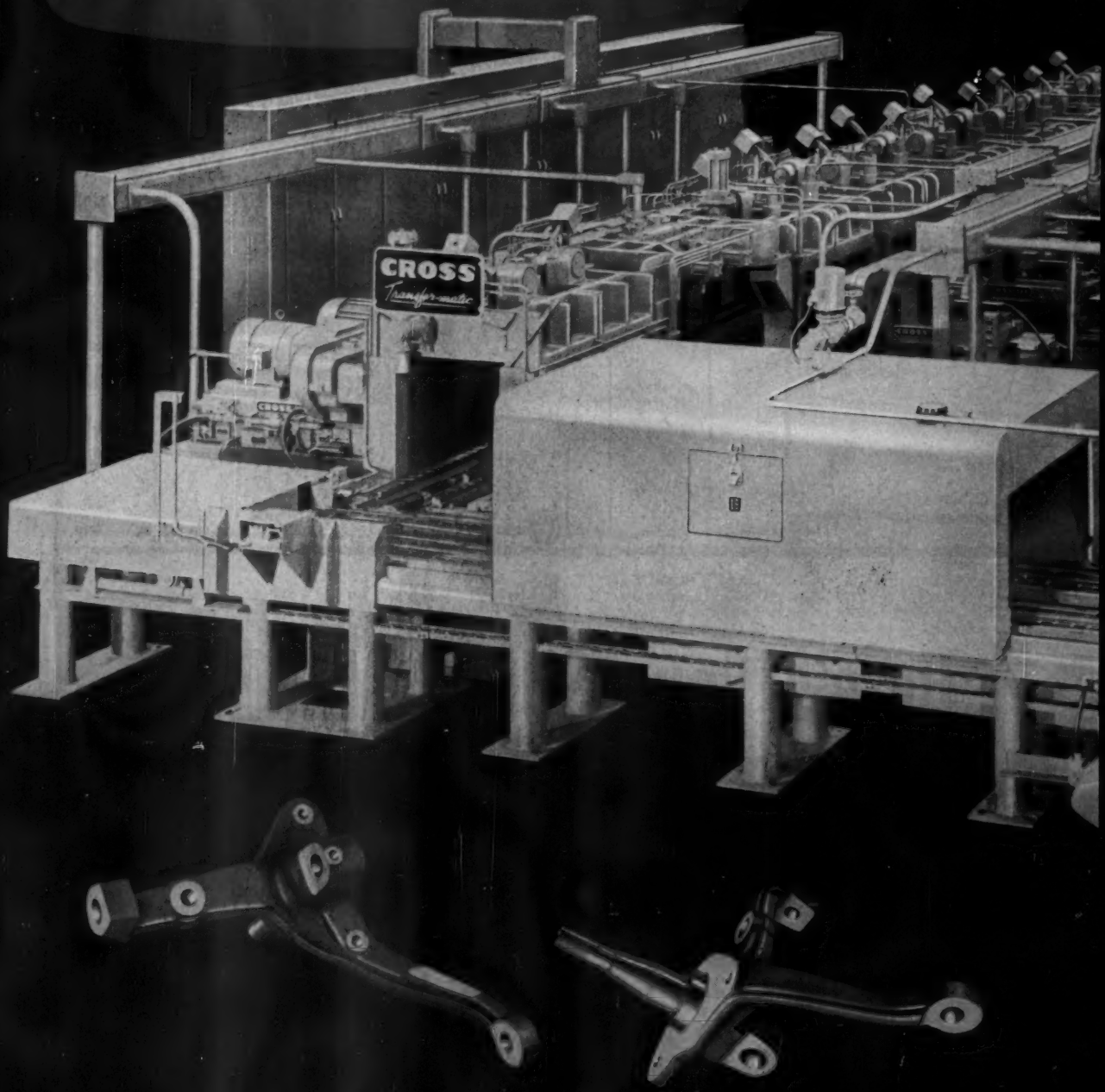
★ Automatic transfer mechanism indexes right and left hand parts through all 17 stations in pairs.

★ Automatic indexing units turn fixtures 82° at Stations 11 and 17.

★ Cross modular unit construction provides flexibility for design changes.

★ Other features: construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and reaming; individual lead screw feed for threading; automatic fixture cleaning unit; complete interchangeability of all standard and special parts for easy maintenance.

Mills, Drills, Reams, Threads Integral Front Wheel Spindle and Steering Arm



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THE CROSS CO.

First in Automation

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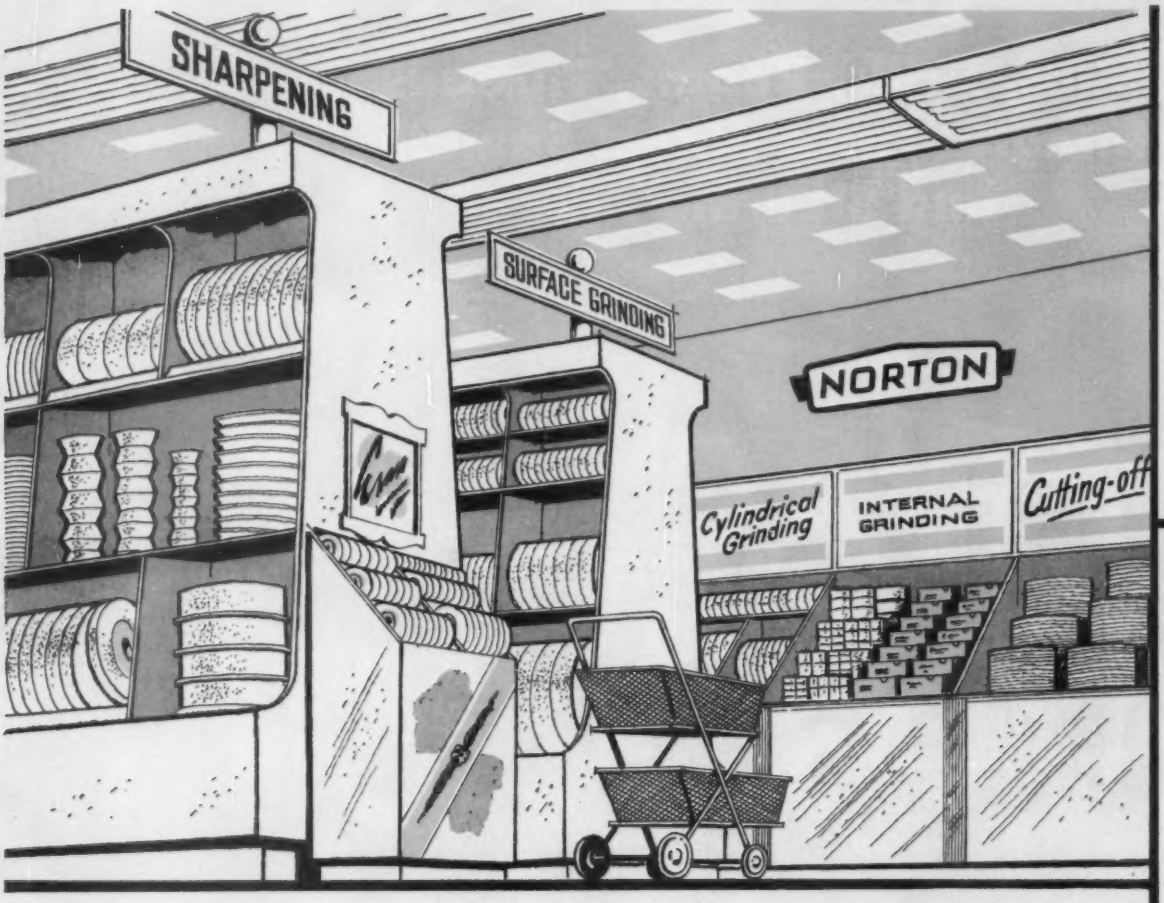


Here's your SUPER-MARKET for tool room grinding wheels

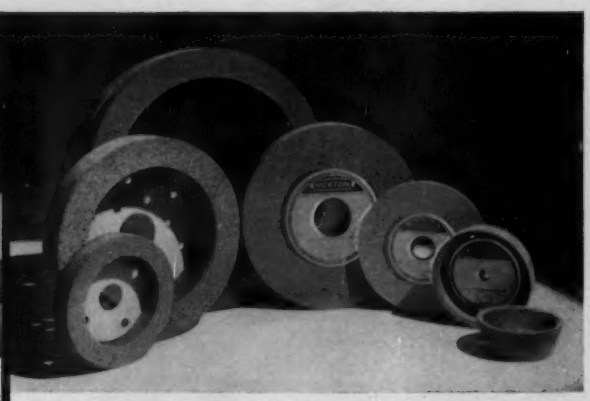
Norton makes wheels for every tool room job... precision-built for "TOUCH OF GOLD" uniformity

"Everything under one roof."

That's the modern super-market advantage Norton brings to your tool room grinding operations.

In the Norton line — the world's largest — you'll find a type and size of wheel, in just the right abrasive and bond, for best results on every tool room grinding job you do.

NORTON G BOND AND BE BOND WHEELS bring you the most efficient vitrified bonds ever developed for precision and semi-precision grinding. For sharpening and for surface, cylindrical and internal grinding on all steels and cast alloys use G Bond or BE Bond Wheels in either 32 ALUNDUM*, 38 ALUNDUM, 19 ALUNDUM, or the new non-premium priced 44 ALUNDUM abrasive.



NORTON K BOND WHEELS in CRYSTOLON* abrasive are the best investment for many carbide grinding jobs. The vitrified K Bond comes in half-grade increments of hardness, enabling you to "pin-point" your specifications. K Bond CRYSTOLON wheels are also excellent for grinding cast iron and other low tensile strength materials.

NORTON DIAMOND WHEELS are the recognized "Crown Jewels" for carbide grinding — backed by long leadership in diamond wheel development and manufacture. For wet grinding carbide tools use them in the regular B resinoid bond — for dry grinding the B6 resinoid bond is recommended.

TWO BOOKLETS THAT TELL YOU ALL. *The Handbook on Tool Room Grinding* is over 200 pages long and crammed with information that will be helpful to you. *How To Select Wheels For Precision Grinding Tool And Constructional Steels* shows the way to correct wheel selection. Get these from your Norton Distributor or write to the nearest District Office of Norton Company, Worcester 6, Massachusetts.

Top performance is the common denominator

Norton wheels, all of them, are made on the most advanced equipment and with the most experienced "know-how" in abrasives manufacture. The result is processing so precise that it can't miss — it brings you new standards of wheel balance and duplication of grinding action.

To you, this means wheel after wheel and lot after lot will grind alike — with the same time-and-money-saving "Touch of Gold" performance.

As a manufacturer of grinding machines as well as grinding wheels, Norton knows how to build wheels exactly to machine requirements — and offers you the longest experience in both to help you produce more at lower cost. For aid in wheel selection, and for helpful booklets on tool room operations, see your Norton Distributor. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning Company, Troy, N. Y. division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated. **For the booklets or other information write to Norton Company, Worcester 6, Mass.**

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Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels Grinding Machines • Refractories

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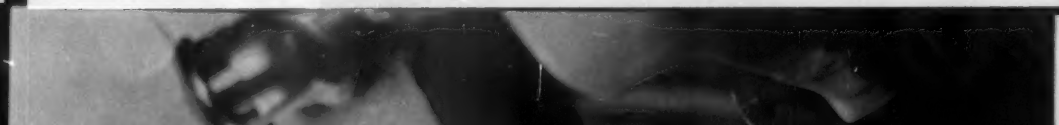
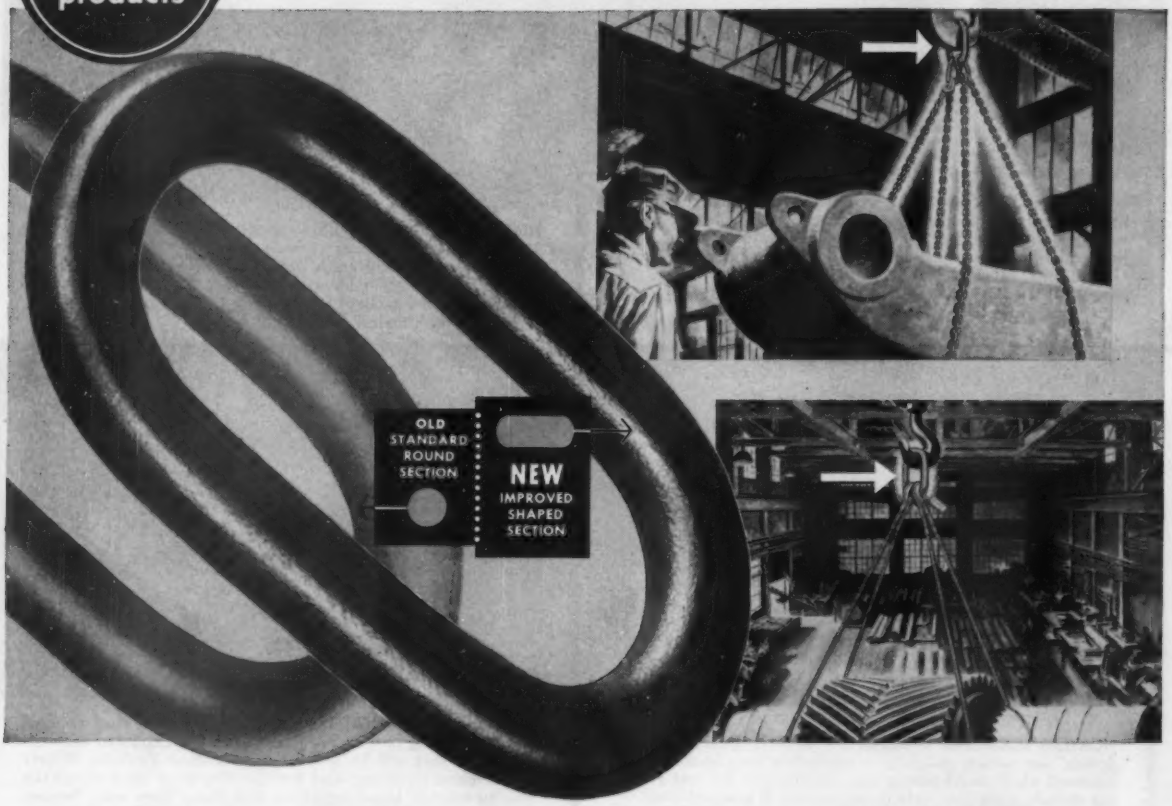


ACCO products

ACCO Registered* Slings-Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY



New Master Link for Slings—Either Chain or Wire Rope—Holds Its Form Under Loads Up to 18% Greater

• Latest product of the continuing research behind ACCO *Registered* Slings is this new Shaped Section Master Link. ACCO's engineers found that by shaping the link—as shown above—they could give it more "dimensional stability"—a better "section modulus." Translated into layman's English this means that the new shaped link, without any increase in weight, will withstand deformation under loads up to 18% greater than a standard round section link will.

Just as shaping a quantity of metal into a structural I-Beam allows it to handle greater loads than it could as a solid beam, so does ACCO's Shaped Section Master Link give better performance under greater loads than a link with a round section.

The new shaped link is smoother and provides a greater factor of safety. It is a better and safer link. It costs us more to make. But it will be offered on all ACCO *Registered* Slings—both wire rope and chain—at no increase in price.

AN EXTRA BONUS OF SAFETY

This latest technological advance adds an extra bonus of safety to ACCO *Registered* Slings.

Each component of an ACCO *Registered* Sling is made from the best materials procurable for its use. Each part must prove to have strength equal to or greater than the sling body. All hooks for ACCO *Registered* Slings are Magnaflux tested. Then these components are assembled into slings according to carefully engineered designs that have proved themselves in rigorous field tests.

The completed sling is then individually proof-tested to twice the working load limit. Then and only then, is it awarded the coveted ACCO Registration Certificate and the identifying ring or tag.

SEE YOUR DISTRIBUTOR

ACCO *Registered* Slings are readily available from a distributor near you. If you don't know him write to our Bridgeport office for his name.

*Trade Mark Registered

ACCO

AMERICAN CHAIN & CABLE

BRIDGEPORT, CONN.

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value

IMPORTANT: For your convenience this sheet is perforated. Tear it out and "buck-slip" it to the proper man in your plant.

"GREEN GRIT" Silicon Carbide Wheels by Carborundum have been developed especially for preliminary roughing operations on cemented carbide tools. You'll find complete technical data on the back of this page.

Ask the man from **CARBORUNDUM** REGISTERED TRADE MARK **BONDED ABRASIVES DIVISION**

Also makers of a complete line of Coated Abrasives and Abrasive Grain

ATTENTION TOOL ROOM FOREMAN: Turn the page and see the Product Performance Report written especially for you.

PRINTED IN U.S.A. 702

Product Performance Report

ROUGH GRINDING WITH "GREEN GRIT"

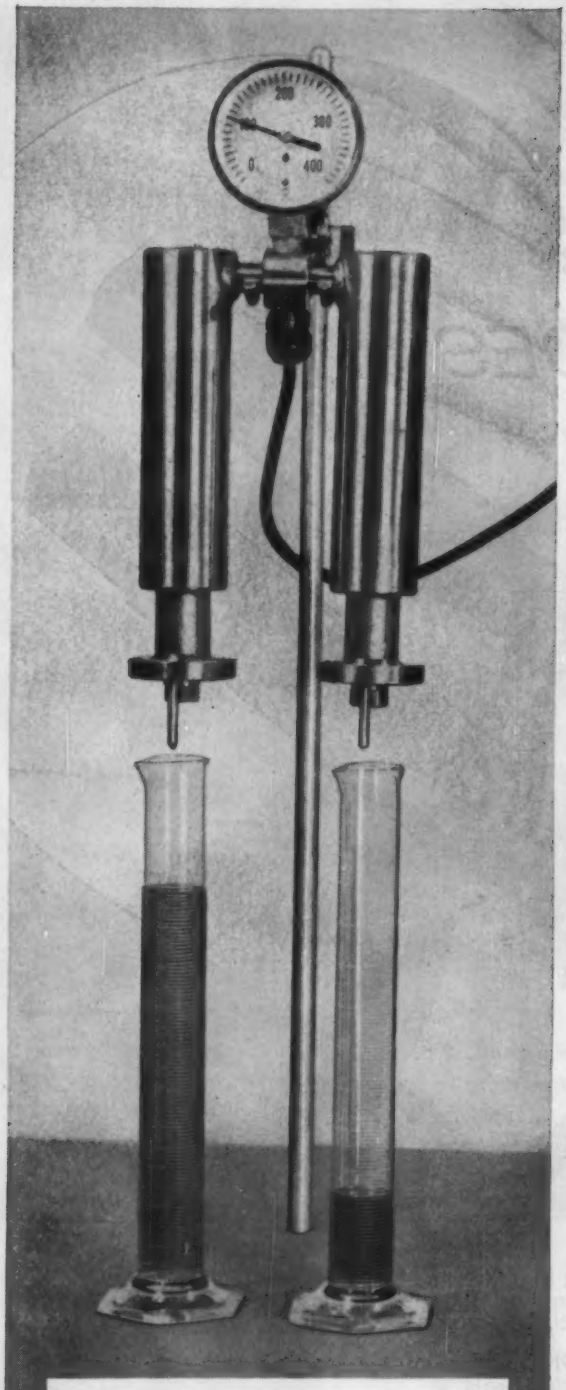
Operation	Rough grind large carbide inserts.
Project	Select a wheel to grind carbide at a fast production rate without checking or cracking the carbide.
Results	Green Grit silicon carbide vitrified wheels are able to remove large areas of tungsten carbide in a short time with a burn free, check free finish. Typical cutting performance shows that green grit wheels in one minute— **a)** Ground .020" from a 1" x 1" carbide insert. **b)** Ground .020" from eight 5/8" x 3/16" carbide inserts. The carbide was free from burn, check and cracks after the grind. Satisfactory finish grinds were produced at an increase of 30% in production time.
Note	Carborundum, leader in abrasive techniques, backs up its products with trained sales representatives, a staff of competent field engineers and an abrasive engineering laboratory ... all available to you to put more sense in your abrasive dollar.

Here is another in the series of Product Performance Reports being released by the Bonded Abrasives Division of The Carborundum Company. A color photograph of this actual operation is shown on the back of this page.

• *Ask your local distributor... or the man from*

CARBORUNDUM
REGISTERED TRADE MARK

PRINTED IN U.S.A.



Less oil loss with Suntac is proved by this leakage demonstrator. Suntac oil is placed in one chamber, a straight mineral oil of the same viscosity in the other. Both oils are pressured through sintered bronze bearings. At 100 psi the straight mineral oil leaks out four times faster than Suntac.

LEAKAGE DEMONSTRATOR PROVES SUNTAC CAN CUT OIL LOSS AS MUCH AS 75%

Expensive equipment overhauls to stop leaks in hydraulic systems can often be avoided by a change to Suntac®. The exceptional antileak characteristics of Suntac oils can reduce oil losses as much as 75%, as can be proved in the leakage demonstrator. *Some users have reported actual drops in oil leakage of 90%.*

Suntac oils give you lower lubrication costs, cleaner equipment and floors, safer working conditions. Their leak-reducing agent leaves no gummy film or residue. In addition, Suntac oils are fortified against oxidation to lengthen oil life...against rust and corrosion to lengthen equipment life.

You'll find Suntac a money and time saver in your hydraulic systems...and a high-quality general-purpose oil for many other uses.

WANT MORE SUNTAC FACTS? Ask your Sun representative for Technical Bulletin 23. Or you can get full details, prices, and delivery information by writing to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. **AM-4.**

SUNOCO

●Sun Oil Company

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

Philadelphia 3, Pa.

In Canada: Sun Oil Company Limited, Toronto & Montreal

That's because Card Spiral Pointed Taps are a big advantage in through-hole or deep-hole tapping. Operators praise the top quality, precision performance and long life of these and all types of Card taps and gages. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through fine distributors from Coast to Coast

HERE'S HOW

Namco VERS-O-TOOL

cuts costs . . . speeds production on end turning and forming

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.

Write today for your copy of 48-page catalog DT-52, or ask our representative to call.

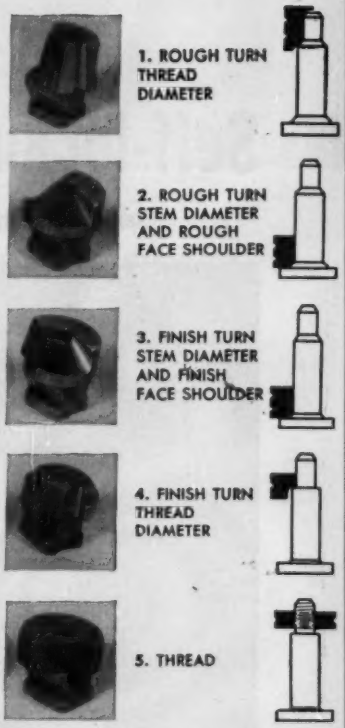
VERS-O-TOOL

LICKS PRODUCTION PROBLEMS BECAUSE:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustments in the head.

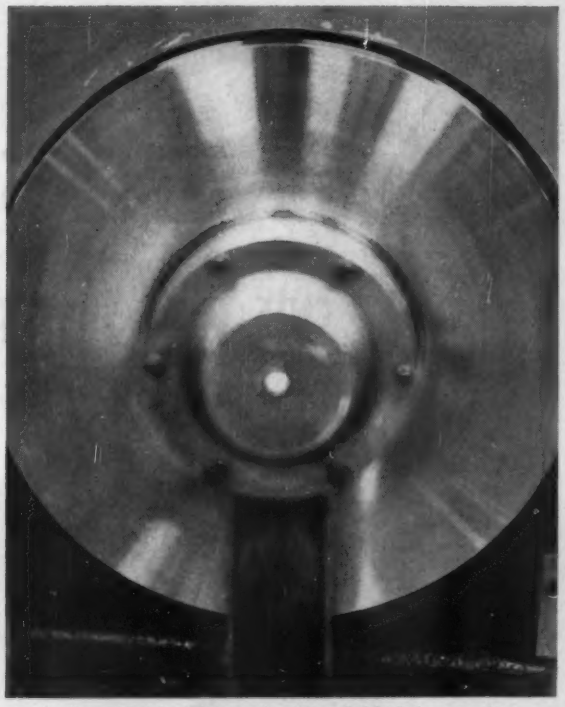
2 All settings in the blocks are made in the toolroom with a micrometer gauge—no need for trial and error run after changing or grinding.

3 Simplicity of basic design means fewer moving parts—insuring long, trouble-free performance.


1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

National Acme

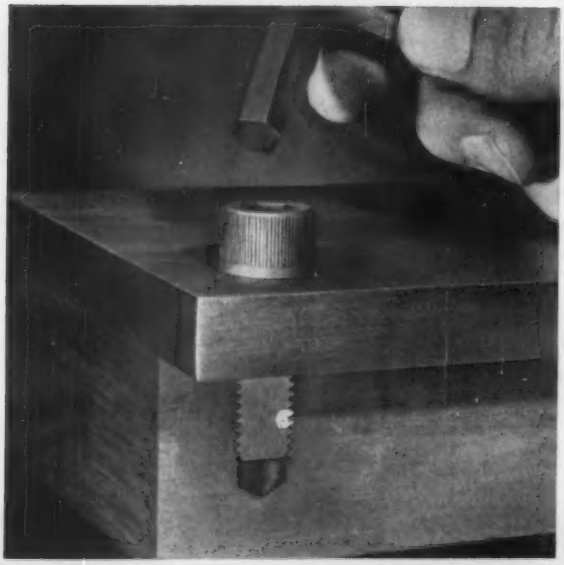
THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 37, Mich.



Self-locking UNBRAKO socket screws keep critical adjustments secure in the eccentric drive mechanism of this fatigue testing machine. Drive system delivers varying loads up to 15,000 pounds force to equipment under test at 1050 cycles per minute.

Vibration won't loosen Self-locking UNBRAKO socket cap screws

Screws with Nylok* device permit adjustments, keep precise settings during long test runs



HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together, and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok self-locking device stay tight under constant vibration.

Take the eccentric drive system in the fatigue testing machine illustrated above, for example. This machine must frequently run for periods up to 2 weeks or longer, day and night, to complete a single test. Loosening of the screws which are used to adjust the tension-setting mechanism could not only cause damage to the machine, but also make the test data worthless. Self-locking UNBRAKO socket head cap screws eliminate such problems.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or pounding, or endless running of a machine, won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives complete catalog and technical data on the entire line of UNBRAKO socket screws with the Nylok self-locking device. Or see your authorized industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

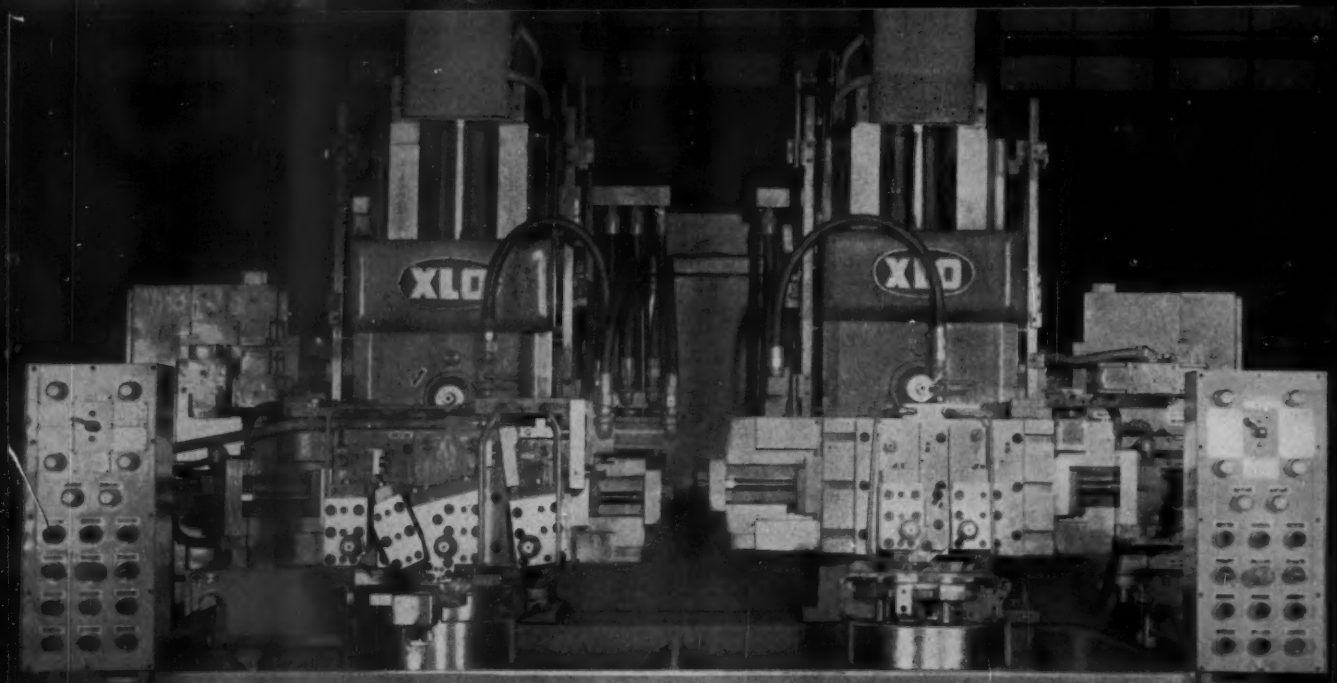
UNBRAKO® SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

*T.M. Reg. U.S. Pat. Off. The Nylok Corporation



EX-CELL-O

Twin spindles Double work capacity

This arrangement uses a magnetic chuck to hold an automotive part for processing.

XLO

EX-CELL-O FOR PRECISION

The Style 432 machine as fitted with an auxiliary slide for angular cuts.

A single operator on this Ex-Cell-O Vertical can precision turn, bore, face, groove and chamfer two identical or completely different workpieces simultaneously. All operations may be performed singly or in combination, and don't overlook the loading ease and tool accessibility of this vertical boring machine.

Ex-Cell-O engineers have cut maintenance time to barest minimum by locating service parts within easy reach. Yet overall design of this machine is clean and compact.

No doubt you are interested in increasing your production output. Call your nearby Ex-Cell-O representative for a conference today. His suggestions cost you nothing—and may save you a considerable sum. Or get in touch with Ex-Cell-O in Detroit directly. We would appreciate the opportunity of putting our years of specialized experience in the machine tool field at your disposal.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

57-20

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING & BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS & BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT & MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

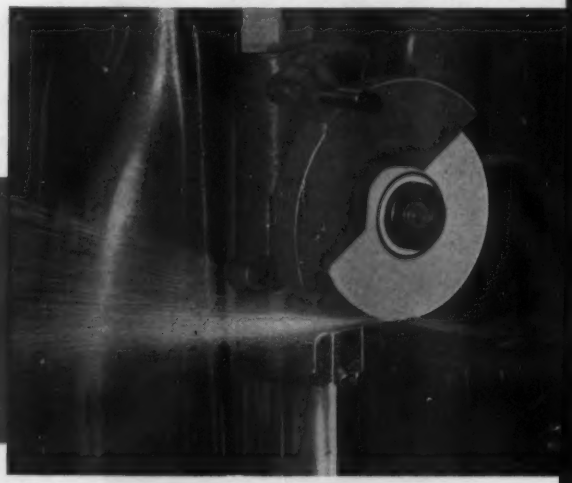
New and Radically Different

SIMONDS SA *Borolon*®
TRADE MARK

Grinding Wheels for Toolroom use

SA Borolon is a single crystal aluminum oxide abrasive possessing superior qualities over conventional white aluminum oxide abrasive. It is produced from a furnace charge consisting of a molten base with a soluble matrix which dissolves, leaving single, natural crystals of abrasive grain *without crushing.*

SA Borolon is tougher because it is free of the inner strains to which crushed abrasive is subjected. It penetrates deeper and cuts faster because each abrasive particle has more sharp, free-cutting edges. It cuts cooler because its resistance to dulling lessens frictional drag. Use these new wheels on your tool grinding jobs — and see the surprising difference in their grinding action. Write for illustrated Catalog Bulletin ESA-272.



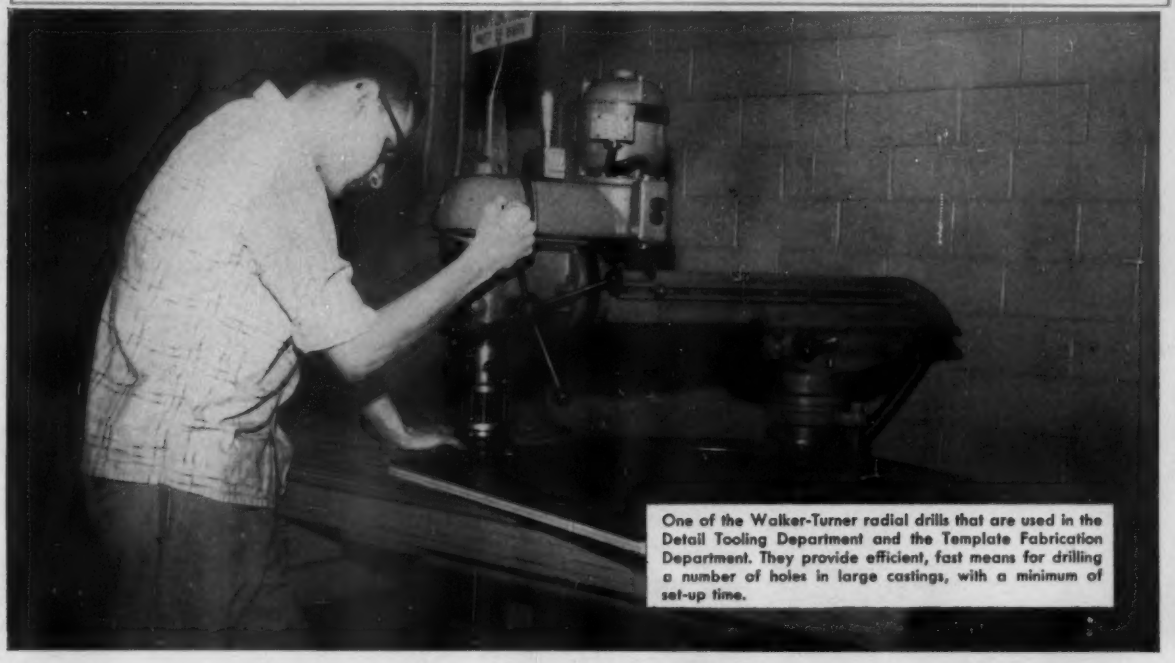
Cooler cutting
Faster grinding
Longer life
Better finish

SIMONDS ABRASIVE CO.

SIMONDS ABRASIVE COMPANY
Tacony & Fraley Sts., Philadelphia 37, Pa.
DIVISION OF SIMONDS SAW AND STEEL CO.
BRANCHES: PHILADELPHIA, CHICAGO, DETROIT, LOS ANGELES, SAN FRANCISCO, PORTLAND, ORE.

CALL YOUR SIMONDS DISTRIBUTOR
LOCAL STOCK FAST SERVICE

INDUSTRY REPORTS ON WALKER-TURNER



One of the Walker-Turner radial drills that are used in the Detail Tooling Department and the Template Fabrication Department. They provide efficient, fast means for drilling a number of holes in large castings, with a minimum of set-up time.

At North American Aviation, Columbus, O.

WALKER-TURNER RADIAL DRILLS IN CONSTANT USE FOR 6 YEARS—AND STILL GOING STRONG!

In the Template Fabrication Department of North American Aviation, two W-T radial drill presses are utilized in a production-line operation for making all router jigs. *These two Walker-Turner units have been in constant use for six years... and have been overhauled only twice.*

In this set-up, positioning holes are drilled in the jig on the first press. Then the work is passed on to the second Walker-Turner radial drill, where the operator drills or countersinks the holes as necessary. It's fast, efficient and convenient.

The Company has found the versatility, rugged construction, and low maintenance of other Walker-Turner "Light-Heavyweights" also make them ideal for many tooling and production jobs in other departments.

Now—A New, Improved Walker-Turner Radial Drill Press

that's even stronger, more versatile, easier to operate.

walker-turner

With its all-new, heavy-duty head assembly, the improved Walker-Turner radial drill press offers all the ruggedness, versatility and efficiency of larger machine tools costing several times as much.

Ask your W-T distributor to demonstrate the many outstanding features of this new line of "Light-Heavyweights." He's listed under "Tools" in your telephone directory. Or write for his name and literature.

Available in 24 models with either 4¼" or 6" spindle travel.

WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WD-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

BRANCHES: PHILADELPHIA, CHICAGO, DETROIT, LOS ANGELES, SAN FRANCISCO, PORTLAND, ORE.

Accurate CINCINNATI

The 1412 Series Cincinnati Shear is shown shearing aluminum sheet. High pressure hydraulic holddowns automatically clamp different gauges of metal with the same pressure.

SHEAR brings substantial increase in sales...

at BRALCO METALS, INC., Los Angeles, California

Micrometer accuracy in squaring, notching and slitting of aluminum sheet and plate makes this Cincinnati Shear a profitable producer. The Bralco Company states "There is no question that this Shear has been responsible for a substantial increase in our sales." Maintained accuracy is insured by hydraulic holddowns, low rake upper knife, inclined ram and all-steel, weld free construction.

Write **Department A** for Shear Catalog S-7R. We also suggest that you contact our Application Engineering Department for information on your shearing problems.

Photos courtesy Bralco Metals, Inc., Los Angeles 22, California.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

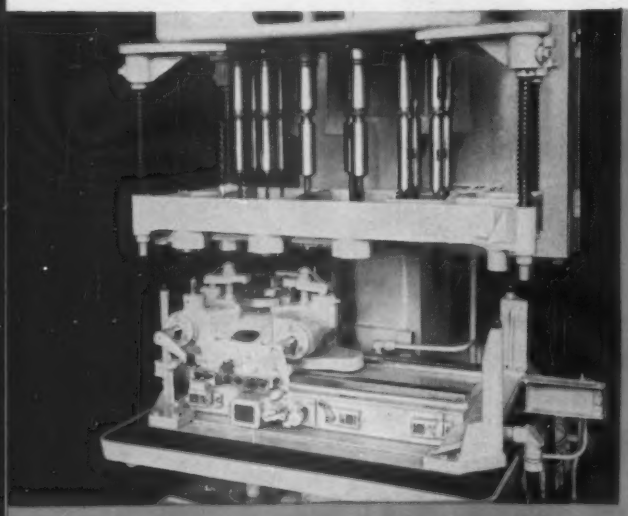
CINCINNATI

Reg. U.S. Pat. Off.

Natco Naturals

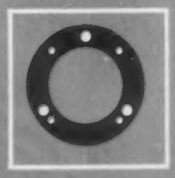
Cost-Cutting Ways
You Can Use
Standard Multi-Spindle Natcos

Any time your parts require machining *more than one hole*–drill, bore, face or tap–it may well be a "Natco Natural." Your standard Natco will produce substantial savings in a surprising number of situations, *even in small job-shop lots!* Call in your nearby Natco field engineer; he'll tell you in short order whether you've got a "Natco Natural" there.

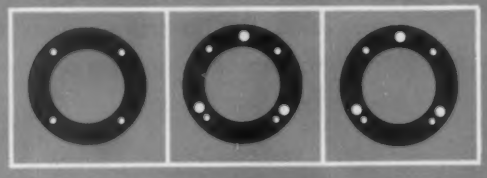


Multiple Drilling Operations on One Part-Face

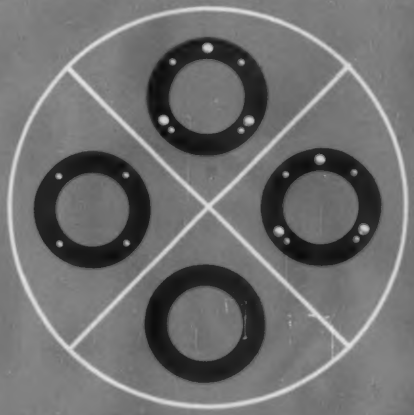
Straight-line indexing *on a Natco H6 produces 49 parts per hour. 4 holes drilled in first position, 3 holes drilled in second position, 4 holes c'bored in third position. One part completed every three strokes. Automatic cycling frees operator for other work. Illustrations below show three other ways of handling this part.*



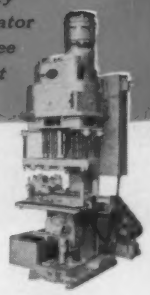
45 parts per hour. *Inexpensive box jig. Operator positions jig under appropriate spindles. One complete part for 3 strokes of machine.*



75 parts per hour. *3-position fixture. Operator shifts parts after each stroke. One part completed every stroke.*



155 parts per hour. *Rotary 4-position index table. Operator unloads and loads while three operations proceed. One part completed every stroke.*



Standard multi-spindle Natcos *range from 1 hp, 10-spindle machines to 25 hp machines with up to 72 spindles. Spindles in standard Natcos are driven through universal joints and located by either adjustable arms or bored slip plates.*

NATCO

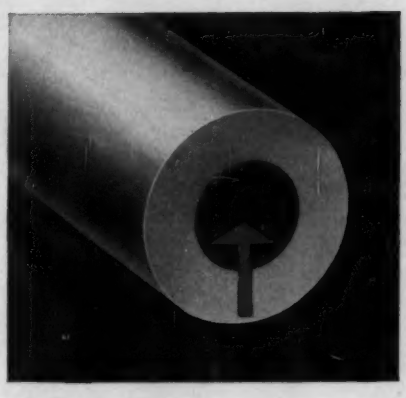
National Automatic Tool Company, Inc.

Richmond, Indiana

Multi-spindle drilling, boring, facing & tapping machines. Special machines for automatic production.

Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.

a hole here makes waste...



a hole here saves waste

Crucible Hollow Tool Steel cut sections eliminate the waste and cost of drilling out solid rounds to make ring-shaped or tubular steel parts, or tools with a center hole. By using these hollow bar sections, cut to length, you do away with unnecessary cutting, drilling, and boring operations, increase machine capacity, and cut scrap losses.

These hollow sections, in just about any O.D. and I.D. combination, or thickness you want, are *immediately* available in five most popular Crucible grades: KETOS oil hardening, SANDERSON water hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air hardening, and NU DIE V hot-work tool steels.

Call your nearby Crucible warehouse for more information, or for speedy delivery. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

Pick exactly the right steel for any job from J & L's complete cold finished line

steel whorl production increased 22% with J & L LEADED STEEL

Superior uniformity and machinability of J & L 1113 Leaded Steel enabled this manufacturer to increase production from 110 to 140 pieces per hour. J & L Leaded Steels give you higher cutting speeds, longer tool life, improved finishes. Call your local distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

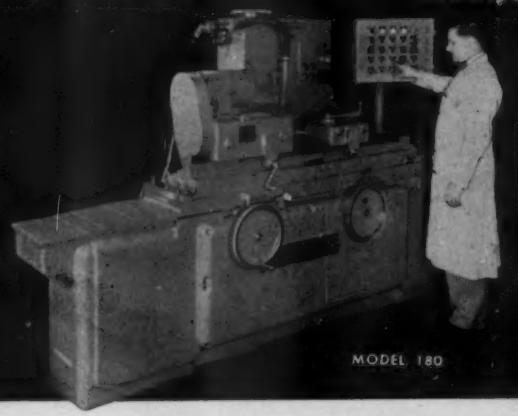
J&L STEEL

Jones & Laughlin

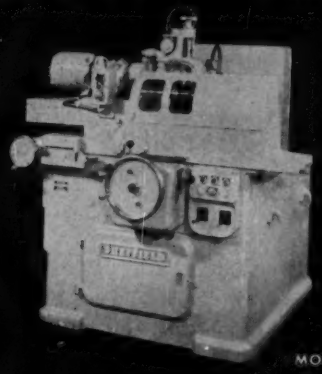
. . . a great name in steel

MACHINING PERFECTION always starts with the right steel

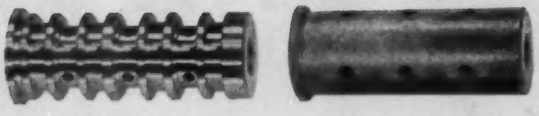
Grind PRECISION FORMS, GROOVES and LANDS in Record Time with SHEFFIELD'S CRUSHTRUE MULTIFORM GRINDERS



MODEL 180



MODEL 109

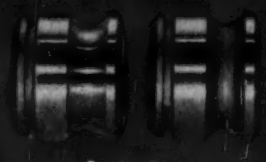


Servo Mechanism Sleeve

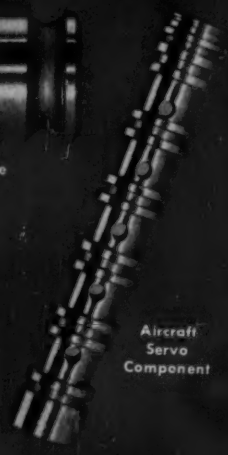
The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

Forms and grooves are precision ground on these machines with comparable speed and economy.

For complete details write to Department 1, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

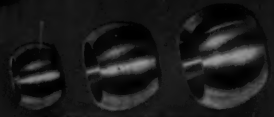


Bearing Race

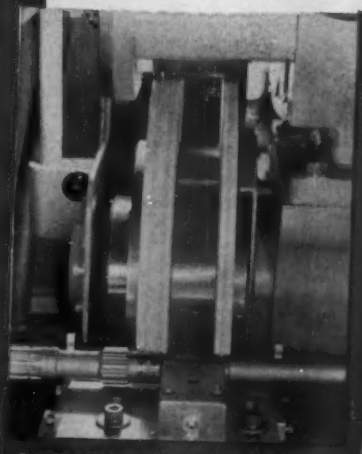


Aircraft Servo Component

Hydraulic Servo Units



Self-aligning Bearings

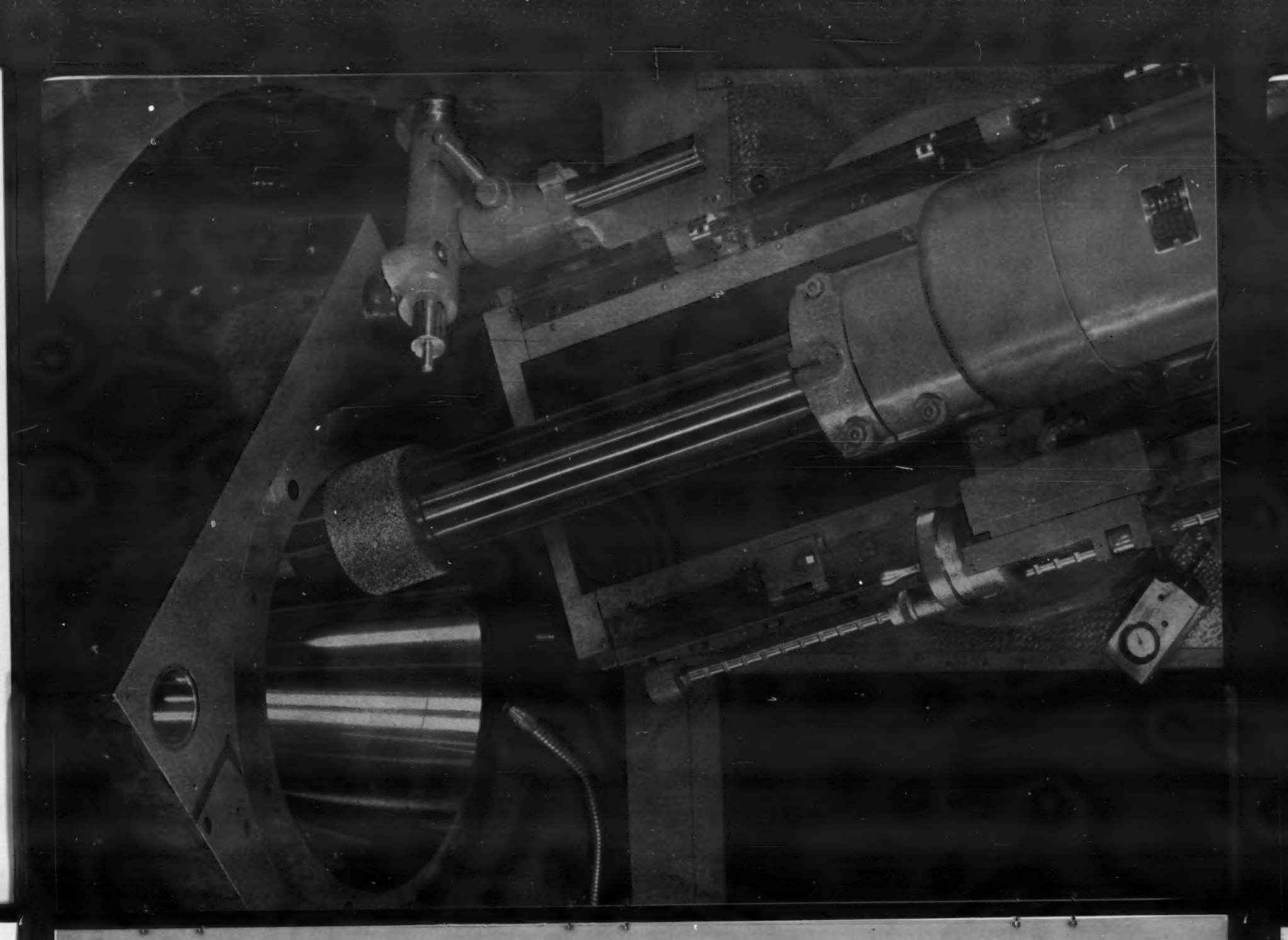


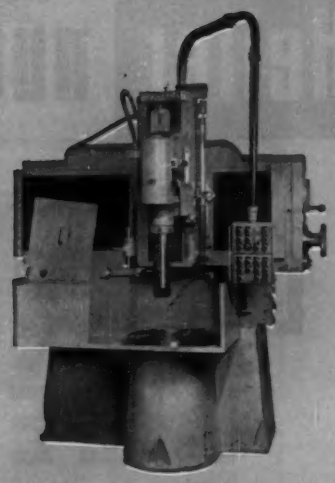
Grinding Grooves in a Transmission Shaft

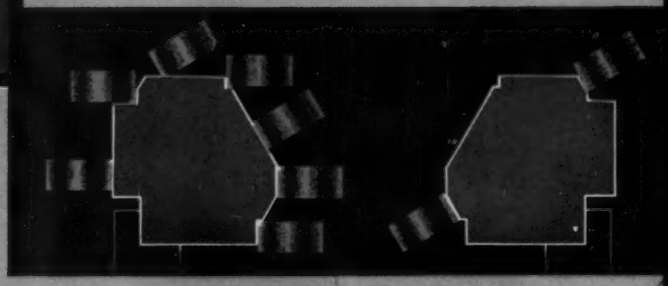
Crushtrue Roll

the SHEFFIELD corporation

...surement for mankind







one setup: nine jobs

As flexible, as responsive as a dentist's drill, a Springfield Vertical Universal Grinder can reach around and into a workpiece to do nine different jobs on one chucking.

If you make a pipeline valve, a mold, a bearing race—requiring micro-inch finish on any or all the faces shown in the diagram—at whatever angle—look into Springfield. These grinders cut down the number of set-ups, frequently eliminate hand-lapping, operate with fewer work-holding devices. And, as a bonus, on jobs calling for extreme concentricity, one angle setting of the Springfield head grinds both faces of mating parts.

All three models readily adaptable to special problems.

Vertical Universal Grinders: swings 18″, 24″ and 42″.

Lathes: Engine and tool room, contouring and reproducing—swings 14″ to 32″.

The Springfield Machine Tool Company
Springfield, Ohio

68TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

Heller nucut®

LONG ANGLE LATHE FILE

gives smoothest finish ...stays sharp longer!

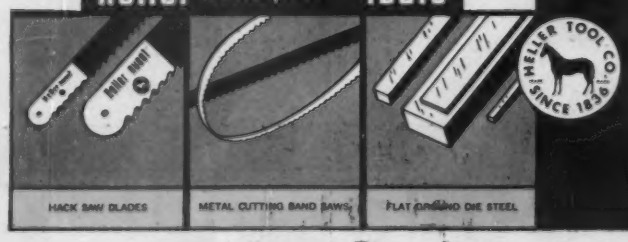
Look at the long 45° angle of those super-sharp precision-cut teeth. It means greater shearing action for removing metal faster and with less pressure without clogging. The long angle provides a self-cleaning action — new chips clear out the old. This special-purpose file is cut from a heavy blank for extra strength and better results on lathe work. Both edges are "safe" to protect work shoulders. It can be used to give the right finishing touch to both hard and soft metals.

You can depend on Heller Nucut Long Angle Lathe Files to speed work and cut costs. A trial is the best convincer.

SOLD *EXCLUSIVELY* THROUGH

Heller DISTRIBUTORS
"YOUR OUTSIDE TOOL ROOM"

Heller "Job Tempered" Tools



A job-proved Heller product!

HOLLER for HELLER ...and be SATISFIED!

CHOOSE THE RIGHT FILE FOR THE JOB! Heller research and over a century of manufacturing experience have been responsible for many of the most practical file developments in the field today. That's why you'll find the *right* files for your jobs among the thousands of types, sizes, shapes, and cuts that make up the Heller AMERICAN PATTERN, SWISS PATTERN, VIXEN, and ROTARY FILE lines.

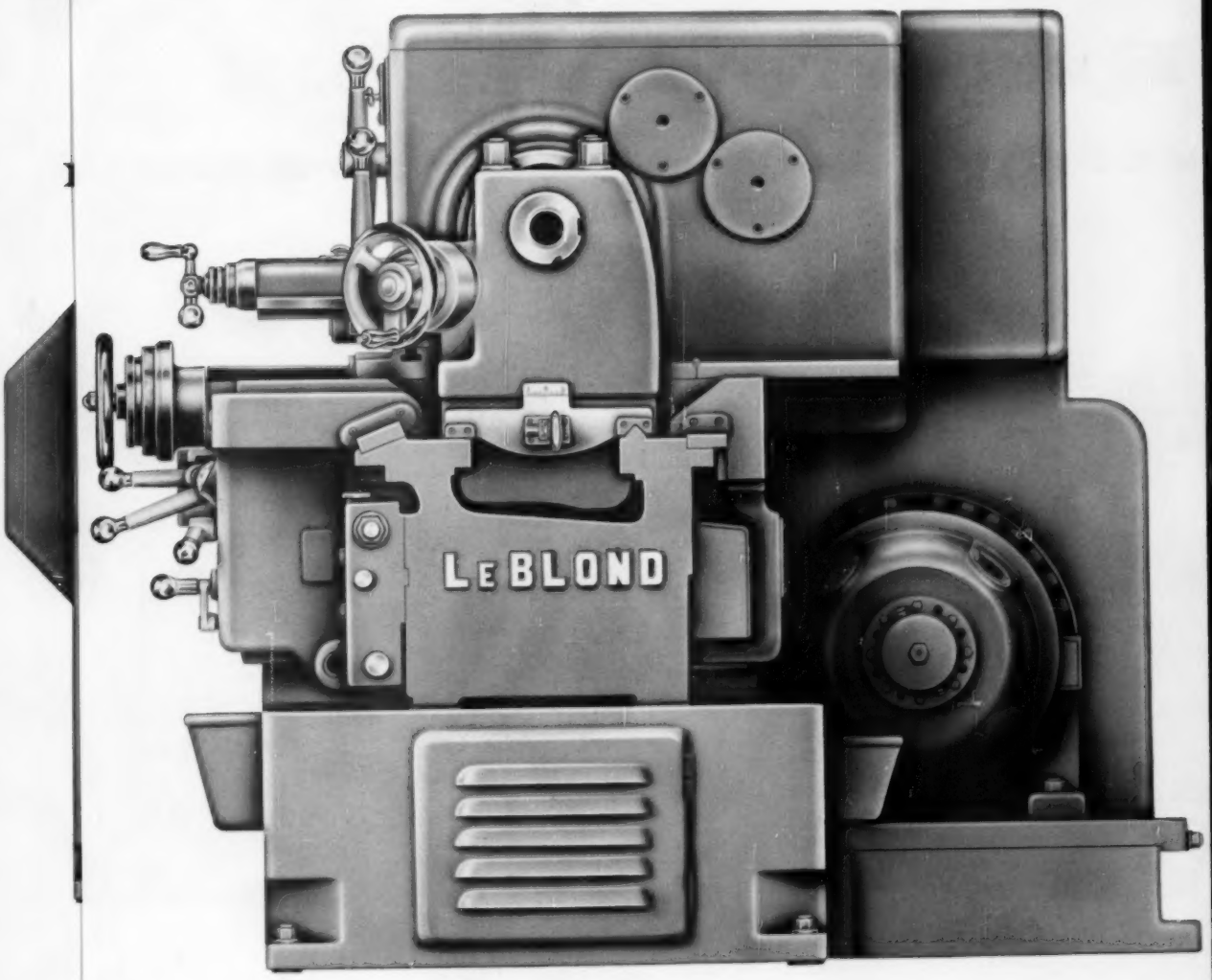
GET LONGER FILE LIFE! All Heller Files are "Job Tempered" by a unique combination of metallurgical and hardening techniques. That's why Heller files cut faster and last longer . . . are favored by filers everywhere!

MORE ON-THE-JOB HELP! Heller's Representatives . . . backed by more than 100 years' problem-solving experience . . . are best equipped to fit the right files to new designs and materials. This valuable technical service is yours for the asking . . . through your nearby Heller distributor.

Heller Tool Co.

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

PACKED WITH POWER, RIGIDITY, STAMINA



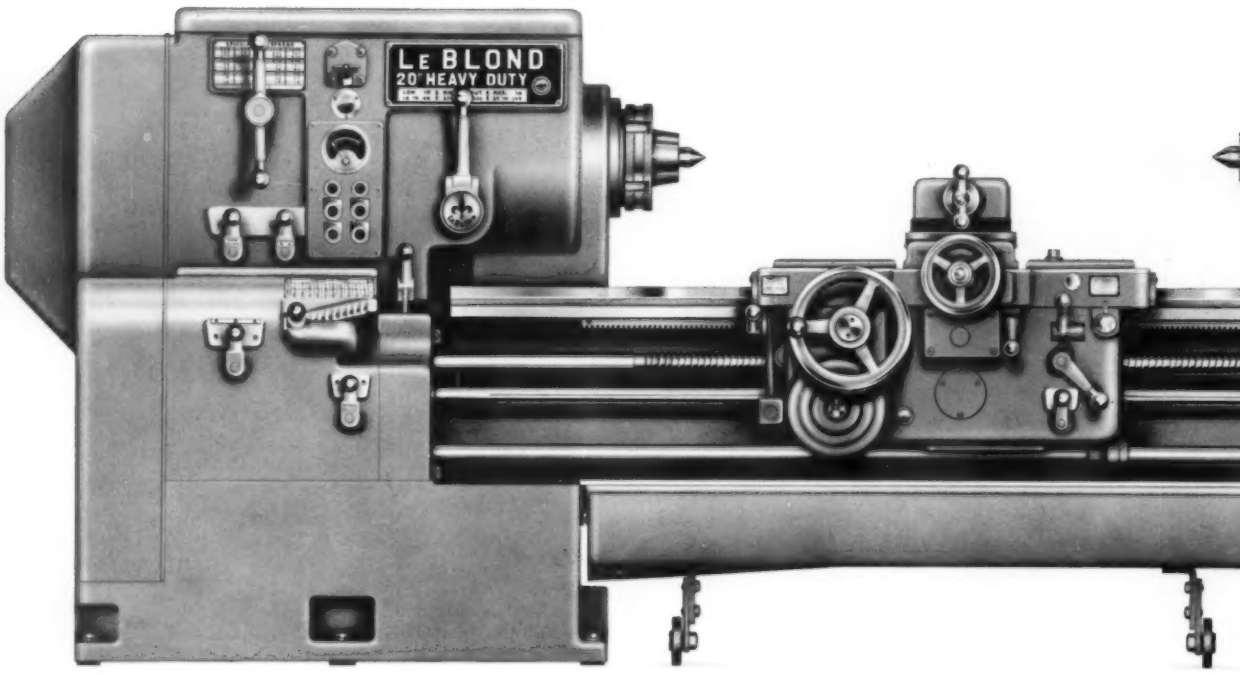
ALLNEW LÉBLOND

20" HEAVY DUTY ENGINE LATHE

ALLNEW

20″ Heavy Duty

power and toughness to use all the bi



The new LeBlond 20″ gives you all the rugged design and construction of the toughest heavy duty turning machines in the world. Power, rigidity, stamina—dramatic new features and new human-engineered operator convenience. Here's why you'll want LeBlond 20″s fighting the production battle on *your* side!

Smooth, usable 40 H. P.—to get the most from today's advanced tools! In the headstock, extremely short, heavy shafts and fine-pitch precision-ground gears deliver power efficiently to the spindle—with minimum no-load horsepower. Plenty of power at lowest speeds, too! For example, *at 10 rpm you can take a cut as deep as ½″ in 16″ diameter work, feeding at .063 ipr!*

36 high-power speeds. Selections made in fine increments, particularly in the low range where small differences in rpm make big differences in tool life. 36 speeds, 10 to 1300 rpm in geometric progression. The tough, forged spindle is supported in 3 places by 5 bearings. DC speed selection at apron available with simplified gearing in head.

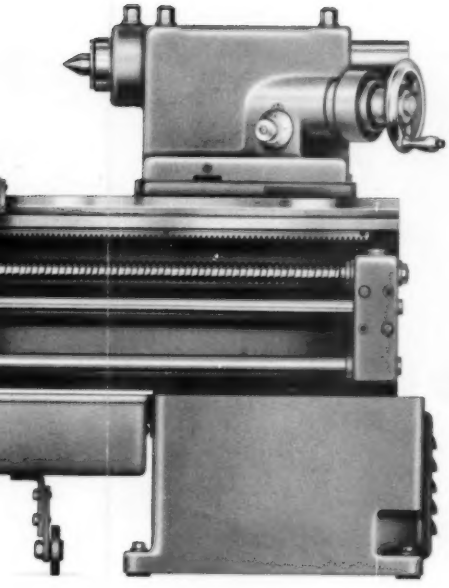
All-new 2-speed tailstock. Tailstock spindle travel is geared for conventional and low speed. When drilling, for example, push handle *in* to drill at slow, powerful feed; pull handle *out* to retract quickly. Tailstock can be moved by power. Exclusive LeBlond worm and rack construction puts handwheel at a convenient angle to the operator, provides exceptionally long travel and positive safety lock against thrust. Full-length support of spindle, even when extended.

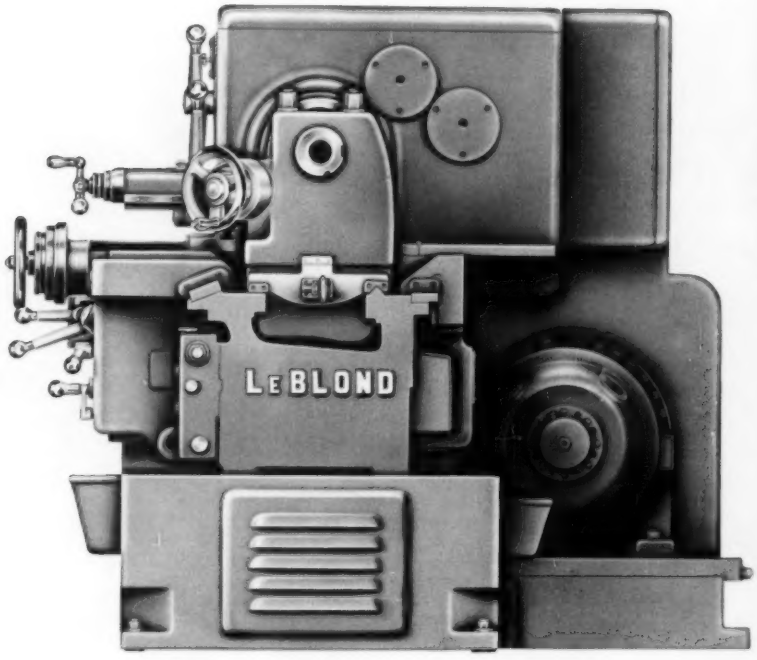
Scientifically planned operator convenience. Human-engineered for operator convenience, the controls of the

LeBLOND

y Engine Lathe

e bite of today's ceramics and carbides!





to 1300 spindle election . ravel is drilling, owerful can be nd rack e to the positive spindle, nan-en- of the

new LeBlond 20" were scientifically studied for shape, size and location. To simplify speed and feed selection, levers are always moved toward operator position for increase, away for decrease. Speed selection is color coded. Spindle is sensitively controlled by means of electric clutch and brake. 4-directional power rapid traverse controlled by single lever. In addition, built-in horsepower meter, chasing dial integral with apron and quick-setting diameter reading dials on crossfeed.

Many famous LeBlond features. Hardened and ground replaceable steel bedways with compensating vee-way design, automatic lubrication to head, quick-change box, apron, single-shot to tailstock, hardened and ground crossfeed screw with compensating nut, one-piece apron, flame hardened rack, totally enclosed quick-change box.

...cut with confidence

Call your LeBlond Distributor or write for complete specifications.

LeBLOND of Cincinnati

THE R. K. LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

A COMPLETELY *New Principle* IN DESIGN . . .

The greatest advance in work holding since the invention of the magnetic chuck

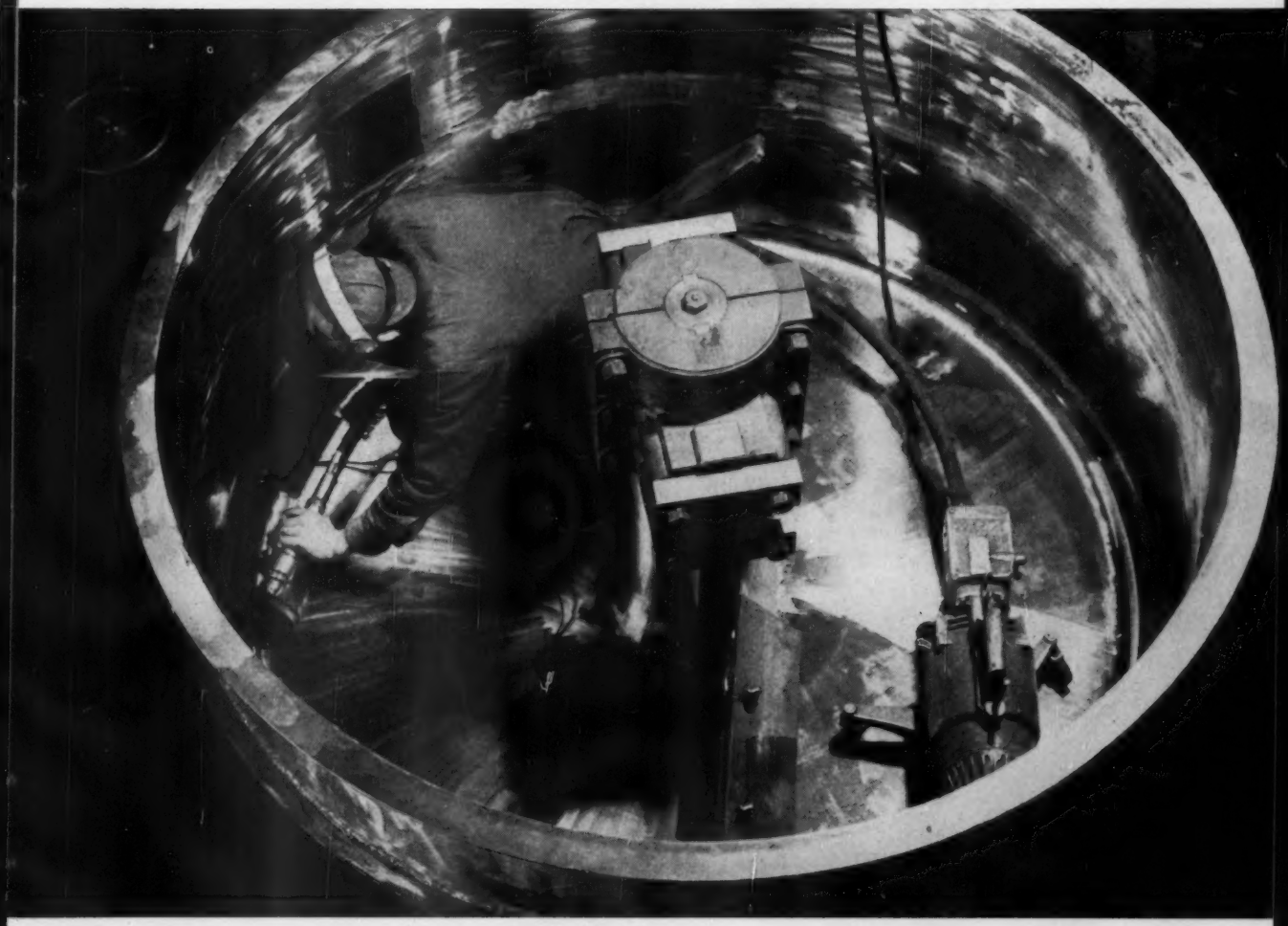
- *Utilizes the most permanent magnetic materials ever produced for magnetic chucks.* Its magnets have many times the coercive force of alloy magnets.
- *All steel top plate.* No soft insulating material.
- *Uniform holding throughout.* Holds all types of work pieces better because of ¼" bar poles.
- *More magnetic area.*
- *The first and only Permanent Magnet Chuck practical for Milling.* Alternating neutralized magnetic fields reduce cutter magnetism making chip adherence no problem.
- *Decreased height.* Lowest in the field.
- *Less than half the weight of former permanent chucks.*
- *Has all the powerful characteristics of an Electro Magnetic Chuck.*
- *All magnetic fields neutralized to prevent magnetism entering machine table or ways.*
- *Solid silver-brazed construction* for real dimensional stability.
- *Each pole a separate and independent magnet in itself.*
- *Because of its light weight construction* reciprocating inertia is not apparent. Lends itself to smooth and fast table operation.

MULTI-POLE FINE DIVISION PERMANENT CHUCKS

CODE	SIZE NO.	WORK SURFACE	MAG. SURFACE	BASE DIM.	CHUCK H'T	LG'TH LEVER	WIDTH LEVER	NET W'T	SHIP. W'T
KAREN	610	6 x 10½	6 x 10½	5⅞ x 11 5/16	2⅛	14½	8 13/16	24	37
KERIC	612	6 x 12½	6 x 12½	5⅞ x 13 5/16	2⅛	17 3/32	9 3/16	29	43
KNUD	618	6 x 18 1/32	6 x 18½	5⅞ x 18 29/32	2⅜	23⅜	9½	43	59

O. S. WALKER COMPANY, Inc.
WORCESTER 8, MASSACHUSETTS

Stainless Steel grinding and polishing information:



go slow...keep temperatures low

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

If you keep Stainless Steel's physical characteristics in mind, you should never have grinding and polishing troubles. Remember these four points:

1. Stainless Steel has low heat conductivity and a high coefficient of expansion. Therefore, keep work as cool as possible. To avoid hot spots, heat tinting and local distortion such as buckling, keep temperatures low. Don't sacrifice surface for time by increasing wheel pressure. For coarse grinding, use wheel speeds of 5000-6000 linear feet per minute. For finer grinding, you can go up to 7000.

2. Stainless Steel is hard and abrasion-resistant. To further avoid overheating, use coolants or lubricants when practicable.

3. Avoid dwelling on any one spot or area. Grind continuously, returning to regrind when the surface has cooled.

4. Never use abrasives too fine for the job. Start with a coarse abrasive and go to successively finer grits. Remember that a fine grit removes more stock when the surface has been roughened by coarse grinding.

Stainless Steel surface finishing and protection is thoroughly covered in our Stainless Steel "Fabrication" book. For your free copy, write on your company letterhead to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

BEFORE THEY COME TO FAIR STREET

They tell us we are exaggerating . . .

"The JIGMIL Technique, through a high degree of accuracy, speed and push-button control, introduces an entirely new philosophy of duplicate production—a method involving substantial savings."

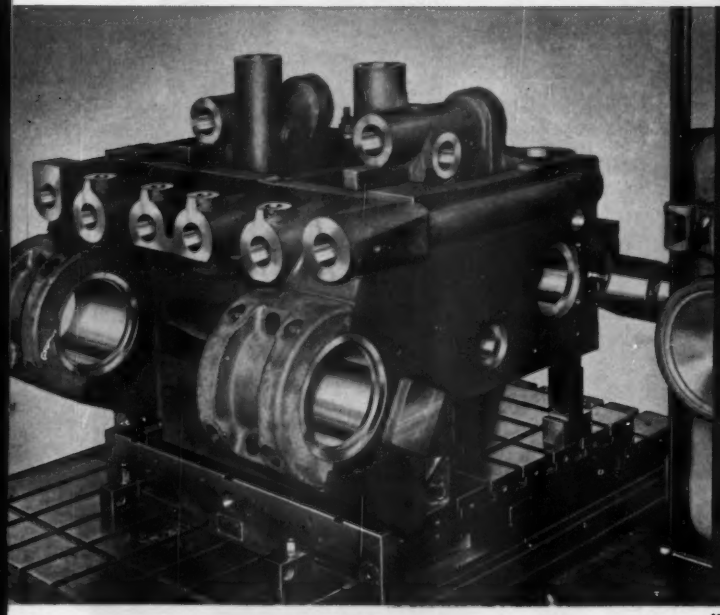
If we sat down across the desk from you and explained what we had done with the JIGMIL Technique in boring and milling parts similar to your own, the chances are you wouldn't believe us. Few people do. But we don't blame them. The JIGMIL Technique sounds too visionary. Savings seem too great. *Although simple, the* JIGMIL *Technique is so revolutionary that you have to see it to believe it.* Will you come to Fair Street (home of the JIGMIL) and see for yourself? We would be delighted to have you.

C. B. DE VLIEG

DE VLIEG MACHINE COMPANY 450 FAIR STREET

Some of Our Users in the Machine Tool Industry

Avey Drilling Machine Co.
Barber-Colman Company
E. W. Bliss Company
Brown & Sharpe Mfg. Co.
Buhr Machine Tool Co.
Cincinnati Milling Machine Co.
Cincinnati Shaper Co.
Cleveland Hobbing Machine Co.
Cross Company
Ex-Cell-O Corporation
Foote-Burt Company
Gallmeyer & Livingston Co.
Gisholt Machine Co.
Gleason Works
Gould & Eberhardt, Inc.
G. A. Gray Company
Hamilton Tool Co.
Heald Machine Co.
Ingersoll Milling Machine Co.
Jones & Lamson Machine Co.
Kearney & Trecker Corp.
King Machine Tool Div.
Landis Tool Co.
Landis Machine Co.
R. K. LeBlond Machine Tool Co
Lees-Bradner Co.
Lodge & Shipley Co.



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error . . . even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL ECONOMY

At one setting! On four sides! Without the aid of jigs! This horizontal broaching fixture was completely machined—*bored* and *milled* to precise limits of accuracy. The JIGMIL Technique requires a minimum of tooling and technical skill to produce precision parts.

Micromatic Hone Corp.
Monarch Machine Tool Co.
Moore Special Tool Co., Inc.
National Acme Co.
National Automatic Tool Co., Inc.
National Broach & Machine Co.
National Machinery Co.
Oilgear Co.
Sheffield Corporation
Snyder Tool and Engineering Co.
Sundstrand Machine Tool Co.
Van Norman Machine Company
Warner & Swasey Company

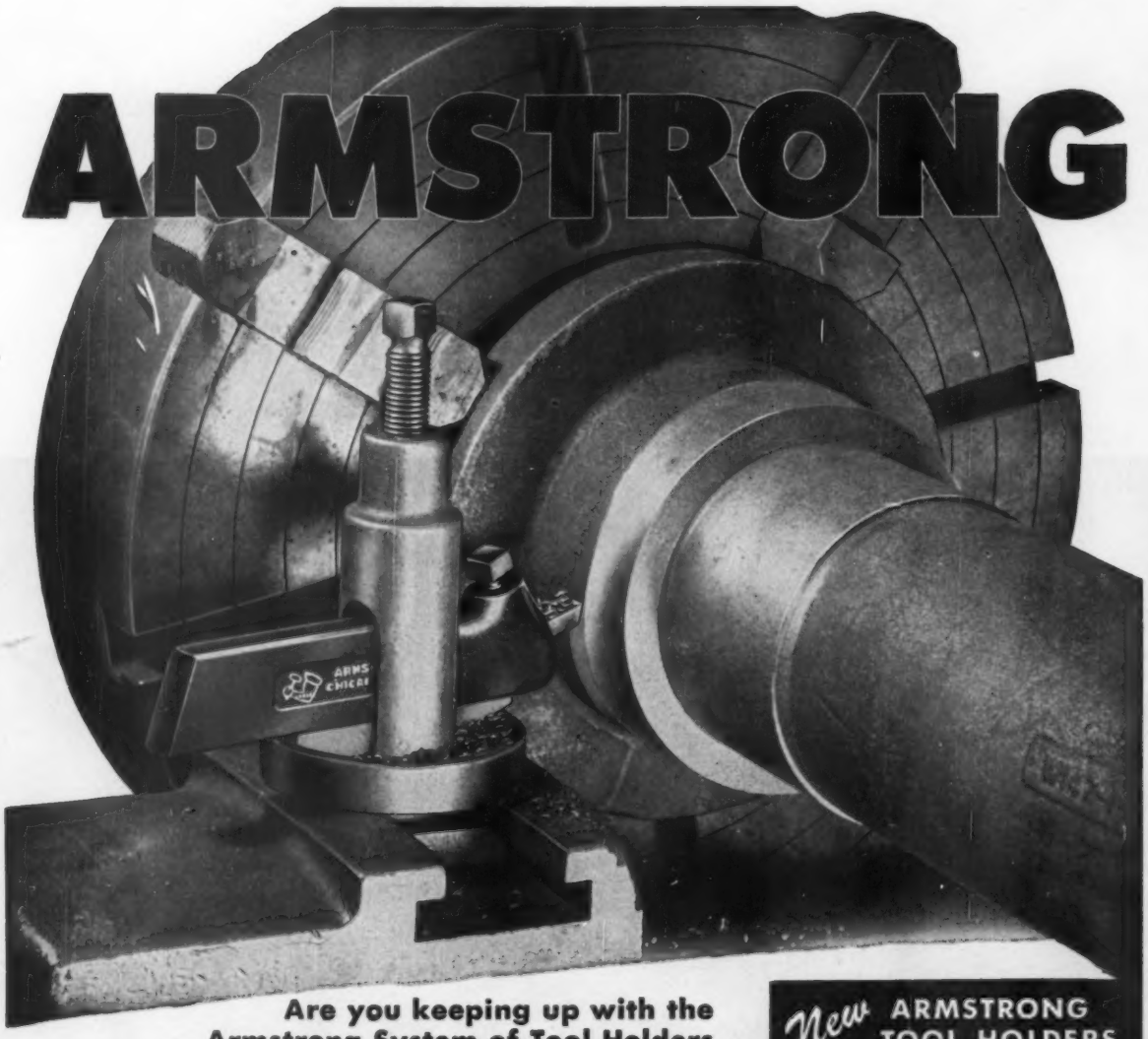
WILL YOU BE THE NEXT TO VISIT FAIR STREET

Our newest catalog will help you decide. May we send it?

DeVlieg
SPIRAMATIC JIGMILS®

FERNDALE • DETROIT 20

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

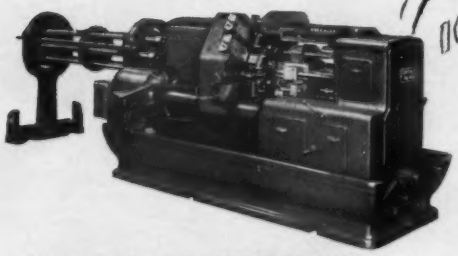
New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30 ILL.

PRODUCTION MACHINERY

GREENLEE Automatic Bar Machines



BOOST PRODUCTION
REDUCE DOWN TIME

It's easy to maintain rigid production schedules . . . prevent costly bottlenecks with Greenlee Bar Automatics. They are always on the job . . . give continuous, reliable service.

You hear much comment about Greenlees' uninterrupted, round-the-clock performance in widely different industries. With good reason, too, for Greenlee offers years of manufacturing experience... plus manufacturing integrity not often duplicated.

Want complete information? Call in the Greenlee man. Let him give you the complete story. Please submit a print when inquiring about a specific job.

SIX AND FOUR-SPINDLE AUTOMATIC BAR MACHINES

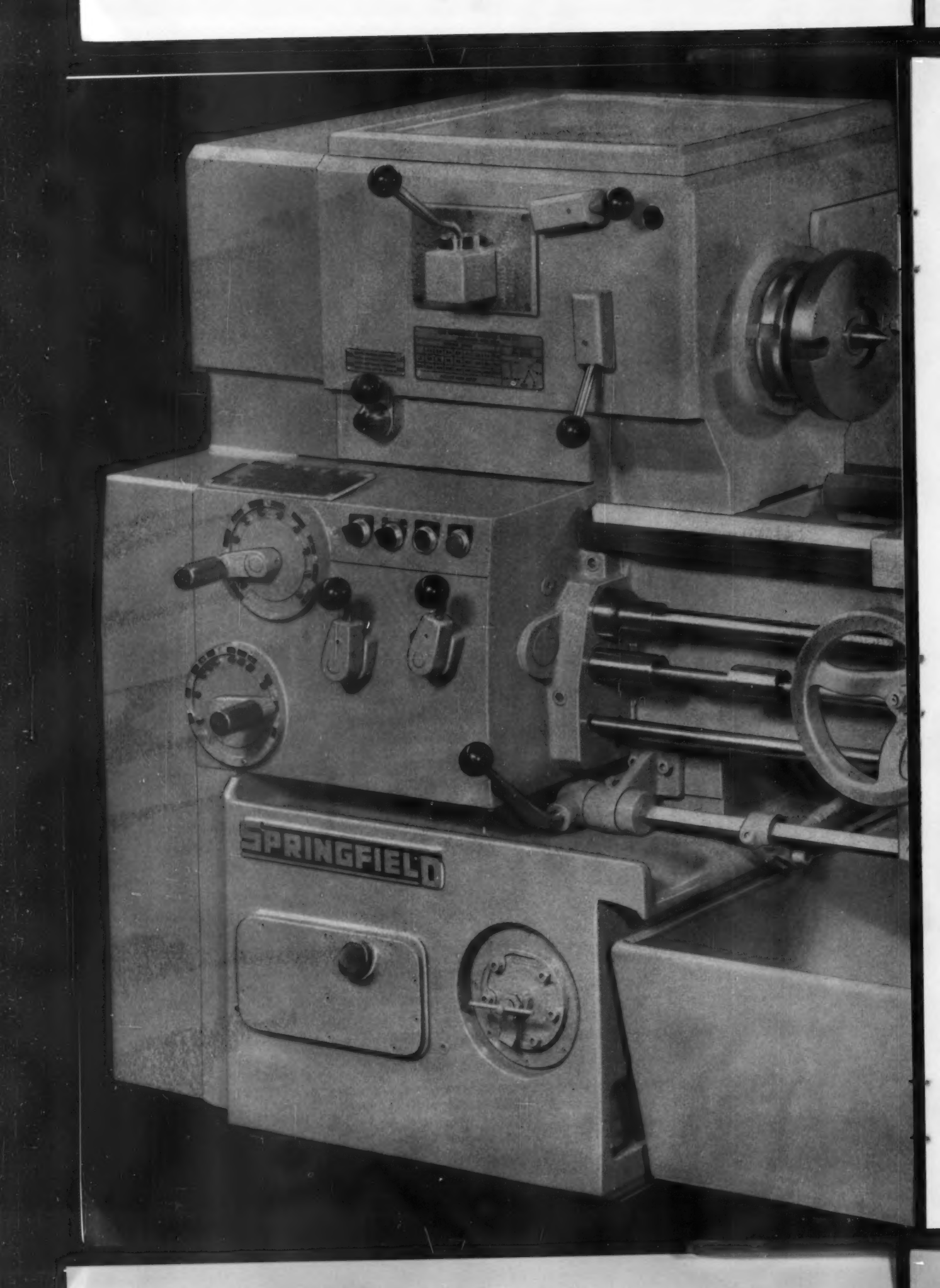
GREENLEE Special Machine Tools

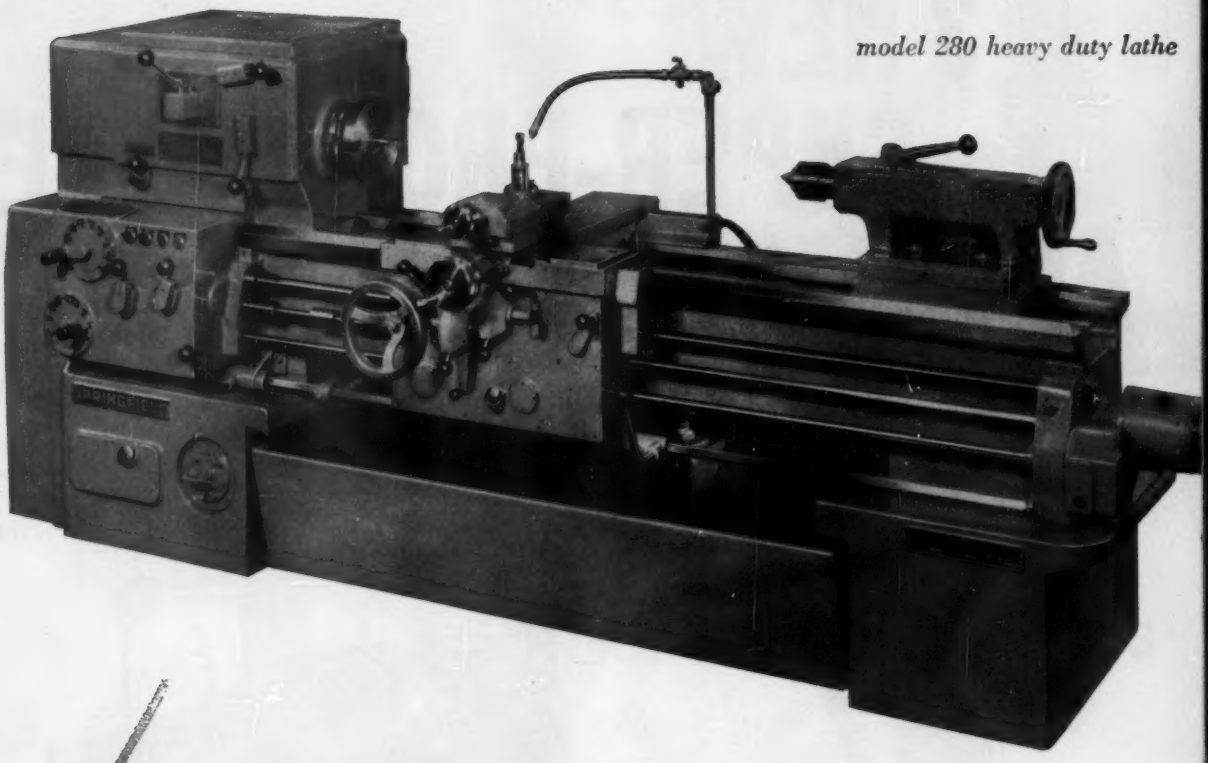
- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Hydro-Borer Precision Boring Machines

WRITE FOR CATALOG No. A-405

GREENLEE BROS. & CO.

1724 MASON AVENUE
ROCKFORD, ILLINOIS


SPRINGFIELD



model 280 heavy duty lathe

it does more work for less money

Springfield is proud to present a new heavy-duty 16″ engine lathe, the Model 280. It offers high horsepower—10, 15 or 20 hp—for heavy cuts, clean design, and ease of operation, all at a reasonable price. Direct simplicity and straightforward design assure low maintenance cost.

It has no electronic brain, because Springfield believes that most of today's jobs still require craftsmanship of the human variety. In the Model 280 the price is for the tool, not the brain.

Only the gears necessary for a given speed are in mesh. Sixteen speeds to choose from, 60 feeds and threads—available instantly to any operator. Unique sealed oil spray lubricates and cools gears. It's the lathe most easily converted to contouring and reproducing with accessories, without budget strain. If you're in the quality market for a new heavy-duty lathe that still respects the contribution of craftsmanship, the Model 280 is for you. Basic price FOB Springfield, Ohio, $8,013.

The Springfield Machine Tool Company
Springfield, Ohio

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

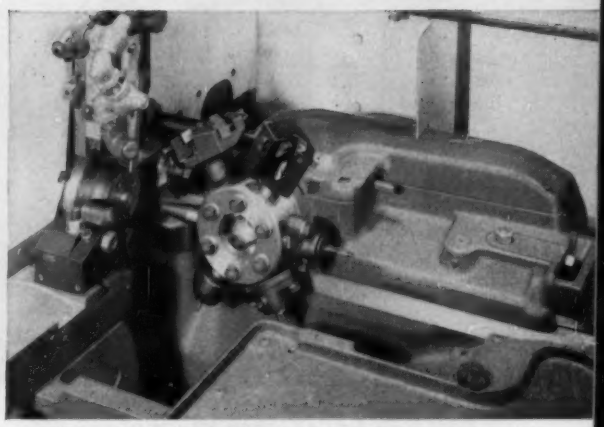
3 NEW SUPER-PRODUCTIVE AUTOMATICS

3 MACHINE SIZES

Spindle Capacities	New Speed Ranges
¾"	5050 to 25 R.P.M.
1¼"	3500 to 17 R.P.M.
1½"	2450 to 17 R.P.M.

by BROWN & SHARPE

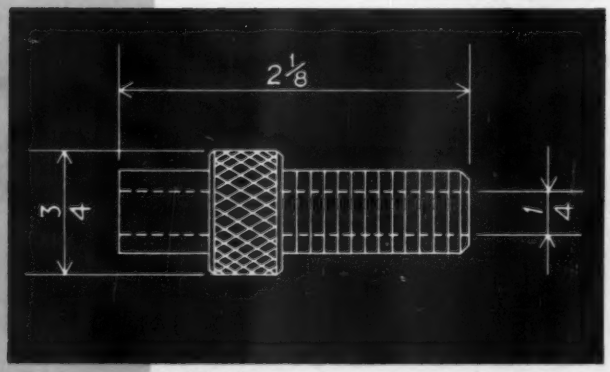
Super-Precision spindle with antifriction bearings reduces radial and thrust play to an absolute minimum. Powerful, positive chain drive delivers full power at all speeds, giving maximum tool life on all materials.



Super-Precise hardened and ground steel ways and cross slides maintain lasting, precise alignment with spindle . . . permit consistent dimensional accuracy to 0.0005" and longer tool life.

Three New No. 2 Automatic Screw Machines

cut production time, boost accuracy on stock up to 1½" diameter



COMPARE PRODUCTION TIME FOR THE ABOVE PART

	Seconds Per Piece	
	Brass	B-1113 Steel
Previous Design Machine	15	120
New No. 2	11	67½

SAVINGS
36% in Brass
76% in Steel

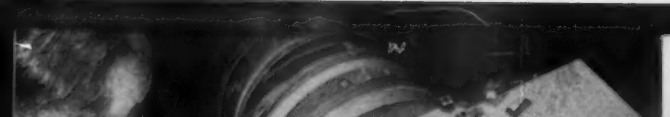
Like the famous Brown & Sharpe "00" introduced two years ago, the new Brown & Sharpe No. 2's now offer accuracy and economy far ahead of any other automatic in their range! Three different machines for ¾", 1¼", or 1½" stock . . . easier set-ups . . . as much as 80% faster production . . . consistently closer tolerances on stock ranging from free machining materials to high alloy steels!

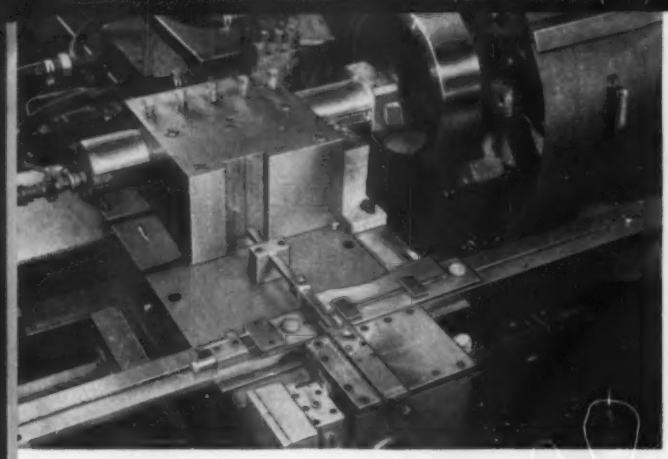
Here are just a few reasons for this super-performance: Spindle speeds up to 20% higher. Turning capacity increased to 3½" length. Exclusive rapid pull-out arrangement is standard equipment . . . keeps drill-end clean and cool, vastly speeds up deep drilling. Full 1" adjustment on turret for convenience of operators and cam designers. Integral vertical slide provides permanent extra tool position. All control by push button. For *better* results on all precision production write for full details on these advanced automatics.
Brown & Sharpe Mfg. Co., Providence, R. I.

B·S

Brown & Sharpe

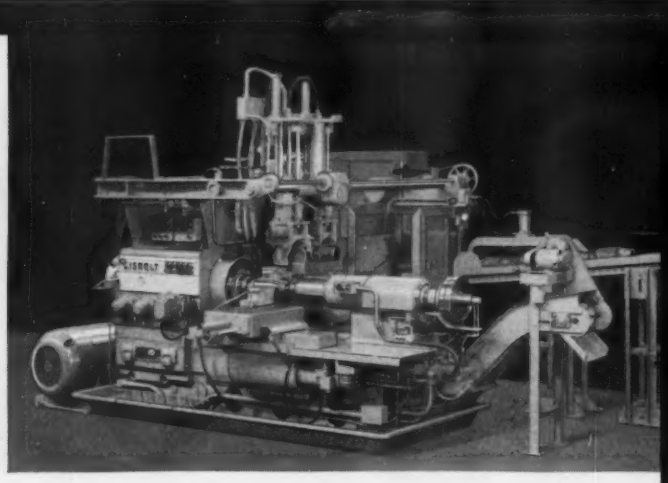
MILLING, GRINDING, AND SCREW MACHINES • CUTTERS
MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS





NO. 24—WITH CHUCK

Ninety pounds of tough bearing steel are removed in two 8-minute operations on this job. One No. 24 handles six types and 24 different sizes of inner and outer bearing races with ease and efficiency. A JETracer on the rear independent slide simplifies spherical, straight and taper boring operations—also improves accuracy and finish and lowers unit costs.



NO. 24—ON TAILSTOCK-SUPPORTED EXPANDING ARBOR

Automatic loading and unloading are part of the machining cycle on this setup. Utilizing overhead clamps and a traversing carriage arrangement, the No. 24 makes fast work of these tough steel tool joint forgings. The operator has separate push-button control over all machine and handling functions for faster, easier setups and change-overs.

YOU CAN REDUCE COSTS ON

NEW GISHOLT MASTERLINE NO. 24

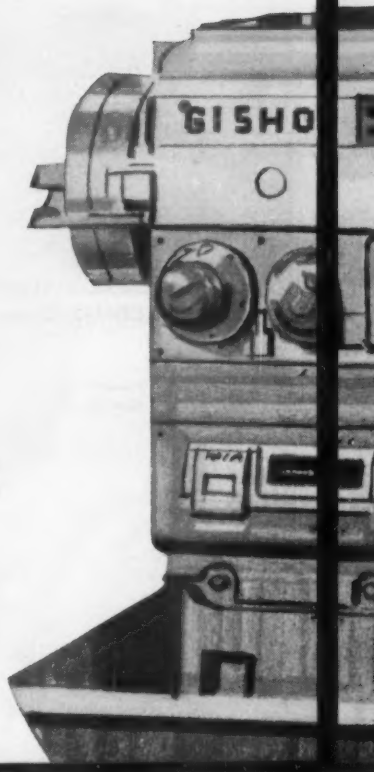
WHETHER YOUR LARGE PART PRODUCTION INVOLVES long, steady runs or small repeat lots, you'll find definite ways to cut costs with this new Gisholt MASTERLINE No. 24 Automatic Production Lathe.

And you can realize these savings whether your work has to be held on an arbor, in a chuck or special fixture, or between-centers with work driver and tailstock—for the big No. 24 will handle parts all four ways.

Cost cutting with this extra powerful (up to 125 h.p.) single-spindle automatic is inherent within its standard automatic cycle. Hydraulic control of all carriage and auxiliary slide movements—plus automatic stopping and starting of the spindle—lets one operator handle two or more of these machines, or perform other jobs during machining time.

Still more savings are realized through faster, easier setup and shorter change-over periods. During setup, all hydraulic actuated movements may be manually controlled. Spindle speeds, feeds and stops are easily changed. This means you can produce a variety of large parts—or handle small repeats—without excessive down time between sizes or jobs.

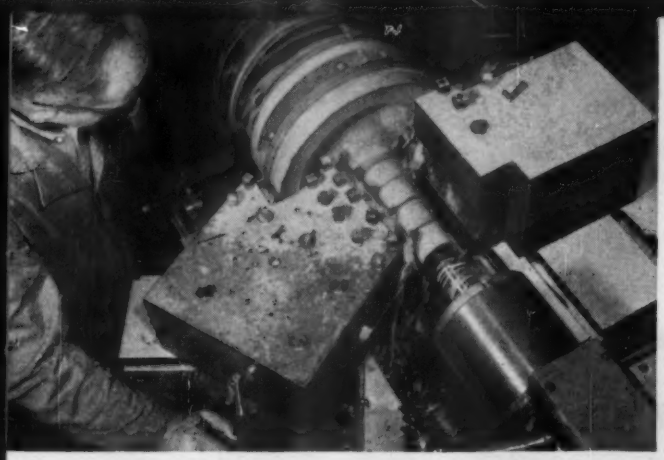
• Whatever type of large part you are producing now—or planning for the future—your Gisholt Representative can show you how and where the No. 24 will produce it for less cost. Call him today—or write Gisholt for complete information.



GISHOLT MACHINE COMPANY

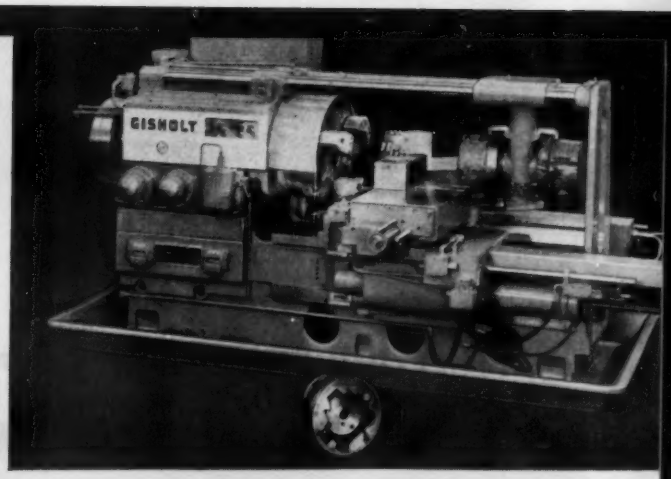
Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS



NO. 24—WITH CHUCK AND TAILSTOCK SUPPORT

With this setup, husky airplane drive gear and propeller shafts are completed in two fast operations on two No. 24's. One man handles both machines. The first operation is shown. Five diameters are machined plus turning, facing and chamfering. The second operation, on the other end, is similar. Floor-to-floor time: 12 min. per operation with 75 lb. of metal removed.



NO. 24—WITH CHUCK AND LOADING ARBOR

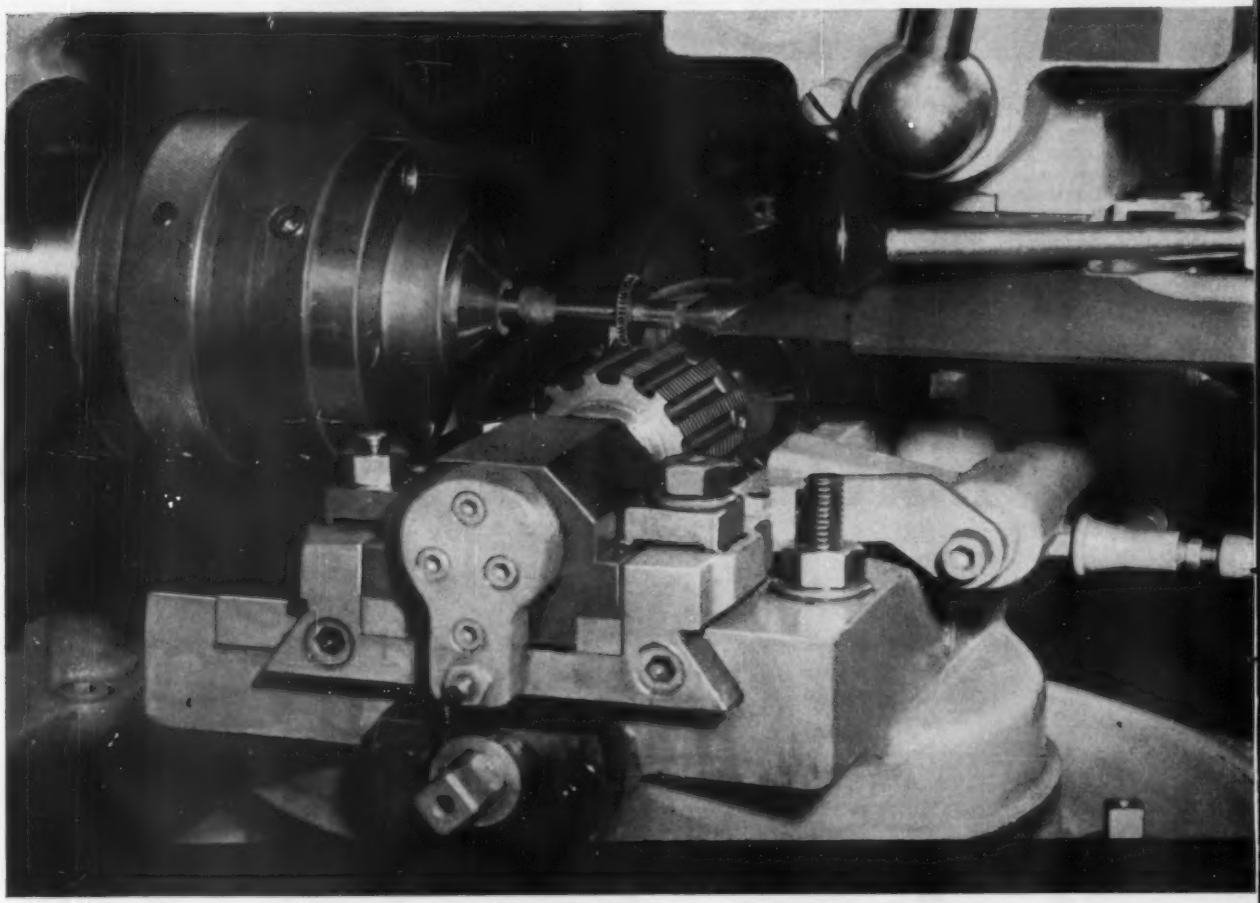
Here, standard tooling plus a unique, indexing-loading arbor arrangement on the No. 24 has cut costs and reduced effort in the machining of heavy cast iron diesel cylinder heads. Floor-to-floor time is only 1.2 minutes. More time is spent making chips because most of the loading-unloading operation is performed while the tools are working on the next part.

LARGE PART PRODUCTION WITH THE

AUTOMATIC PRODUCTION LATHE

HOBBING PRECISION GEARS

within precision Class 2 AGMA tolerances.....



Fine-pitch instrument gears are cut on Barber-Colman Precision No. 6-10 Hobbing Machines at Belock Instrument Corporation. For their most accurate gears, Belock uses Barber-Colman Class AA hobs exclusively.

with standard-type precision hobbing machines

The Belock Instrument Corporation manufactures complex electronic and electromechanical systems and components. The constant demand placed on them for greater accuracy in these instruments requires all gears to be cut to very close tolerances and yet be completed on a practical production basis.

Belock hobs such gears consistently within Precision Class 2 AGMA tolerances, using a battery of *standard-type* Barber-Colman Precision No. 6-10 hobbing machines. These are unusually close tolerances and the use of *standard-type machines* for these gear accuracies is a good reason for taking a close look at the elements and methods they employ.

here's how they do it:
Gear blanks are machined to Precision AGMA tolerances. Then, for maximum accuracy in hobbing all precision gears, Barber-Colman Class AA single-thread ground hobs are used. These hobs are manufactured with tapered bores, since taper-bore hobs can, with greater ease, be mounted more accurately on the hob arbor to eliminate runout. These hobs are resharpened to original class AA accuracy using a Barber-Colman No. 6-5 Hob Sharpening Machine.

The gears are finish-hobbed on Barber-Colman Precision No. 6-10 Hobbing Machines. These machines hold a precision relationship between the rotation of the work and the rotation of the hob which allows them to consistently hob gears to these fine tolerances.

Barber-Colman Precision No. 6-10 Hobbing Machines are built with large precision index worm gears and single-thread worms for maximum tooth spacing accuracy. All vital machine parts are specially selected for close tolerances.

If you have a problem of producing consistent accuracy in gear cutting, consult Barber-Colman Hobbing Engineers for assistance. They can help you obtain any class of accuracy you desire with the most practical equipment for doing it.

this is an actual production record:

GEAR	HOB	OPERATION
Diametrical Pitch — 64	Class AA Ultra-Precision	Feed — .015"/rev.
Pressure Angle — 20°	2" Diameter, Taper Bore	Speed — 120 sfm
Outside Diameter — .7812"	Pieces per Sharpening — 720	
Pitch Diameter — .7500"	Stock Removal per Sharpening — .005"	
Face Width — .093"		
Material — 303 Stainless, 30-35 RC		

BARBER-COLMAN COMPANY
614 ROCK STREET • ROCKFORD, ILLINOIS
Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

Now in Production...

3 NEW REPUBLIC IRON POWDERS

...WITH Controlled dimensional factor

TYPE "G" TYPE "N" TYPE "S"

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

To meet the varied requirements of industry, Republic's Metal Powder Division has developed and is producing three new grades of iron powder suitable for the molding and manufacture of mechanical parts.

Each one of these new powders has a variable controlled characteristic known as *Controlled Dimensional Factor.* This term simply means that in the presence of copper, Republic Iron Powder—depending on type—can be made to grow, remain stable, or shrink, within acceptable limits. These new powders have been designated as:

TYPE "G" FOR GROWTH—A powder having a definite growth-characteristic in the presence of copper, and developed for use in many *existing* dies designed for powder which expands when sintered.

TYPE "N" FOR NORMAL—This powder has been given normal variation in dimensional change from a slight shrinkage to a slight growth, depending upon the end-result required.

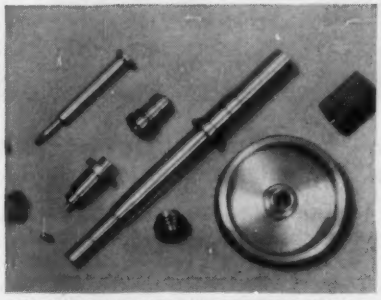
TYPE "S" FOR SHRINKAGE—A powder with an extremely high shrinkage-characteristic which can be used to attain certain tensile strengths with lesser quantities of copper.

Both "S" and "N" powders should prove exceptionally advantageous to parts producers faced with the problem of what to do with dies that have become oversize through wear. Types "S" and "N" make possible the production of parts to original dimensions without the need for extensive or expensive re-working of dies.

Controlled Dimensional Factor is an exclusive Republic development retaining the excellent chemistry and high green strength always associated with Republic Iron Powder.

For complete information on chemical composition, physical properties and test evaluations, write for Republic Booklet Adv. 763.

PRODUCTION FACILITIES, plus complete design and engineering service, go to work for you as an extension of your plant, when you have stamped and drawn parts fabricated by Republic's Pressed Steel Division. One example of a wide variety of steel parts mass-produced to specification, at the lowest possible cost, is the truck-shaft bracket shown above. Write for Booklet Adv. 681.



PRODUCTION OF PRECISION PARTS at higher speeds and feeds with fine finished surfaces and longer tool life, is made possible by the use of Republic Cold Finished Steels. Republic offers you a complete range of carbon, alloy, and stainless analyses drawn to precise size and cross section. Mail the coupon today for complete information on Republic Cold Finished Steels.

PRODUCTION OF BUILT-UP, INTERLOCKING OR ASSOCIATED PARTS is greatly simplified by the use of Republic Cold Drawn Special Sections. Machining time and costs are reduced to a minimum because the sections are preformed to the predominating cross section of the part. Cold drawing also improves physical properties in the parts. Available in all grades of carbon, alloy and stainless steel. Send coupon for more data.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-3467
3102 East 45th St., Cleveland 27, Ohio

Please send more information on these Republic products:
- ☐ Iron Powder (Booklet Adv. 763)
- ☐ Stampings (Booklet Adv. 681)
- ☐ Cold Finished Steels
- ☐ Special Sections

Name_____ Title_____

Company_____

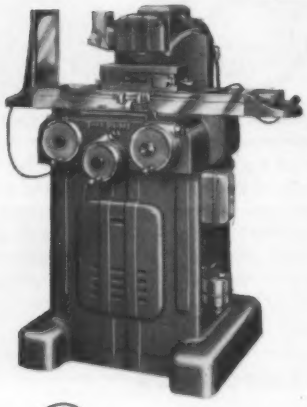
Address_____

City_____ Zone____ State_____

SPARK TEST

Shows how a Taft-Peirce No. 1 Surface Grinder Repeats to .00005"

Here is a surface grinder so accurate that few people would believe it until this simple demonstration was devised.

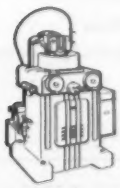


Take a side wheel grinding setup. Grind to a zero reading on the cross feed dial. Move the work away one or two thousandths with the cross feed vernier, then back to its original position. NOTE: There's no grinding spark. Now, feed in ½ of a tenth with the vernier and SEE THE GRINDING SPARK.

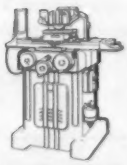
To our knowledge there's never been a standard grinder built before that even comes close to the accuracy of a T-P No. 1 Surface Grinder. An experienced operator frequently can grind to less than .00005" . . . with surfaces so smooth, in many cases, they seal without lapping.

Table, saddle, and column travel on anti-friction bearings retained in vees of hardened and ground alloy steel. Tilting wheelhead simplifies setups. Vernier fine-feed attachments, graduated in .0001" increments spaced ½" apart, are available for either the horizontal or vertical feed.

Compact, yet heavier than other machines, the No. 1 Surface Grinder maintains its accuracy over many years of rugged service. For more information, write for bulletin.

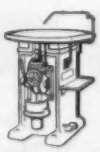


Rotary Surface Grinders



Precision Surface Grinders

Lapping Machines



Back Spot Facing Machines

T-P means Top Precision T P

THE TAFT-PEIRCE MANUFACTURING COMPANY • WOONSOCKET, RHODE ISLAND

The real cost of MOTORS

The cost of a motor extends over its entire lifetime. It does not end with purchase price. Cost *goes up* with every shutdown, every motor maintenance stoppage. Cost *stays down* when you buy quality. And quality means Allis-Chalmers.

All of these extras that don't show on the Allis-Chalmers nameplate — more copper, more iron, more cooling provisions—exemplify the quality-craftsmanship that goes in before the price tag goes on.

For the "long run," either as a new machinery component or as replacement, specify Allis-Chalmers. Find out more about *real* quality in motors from your A-C district office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5287

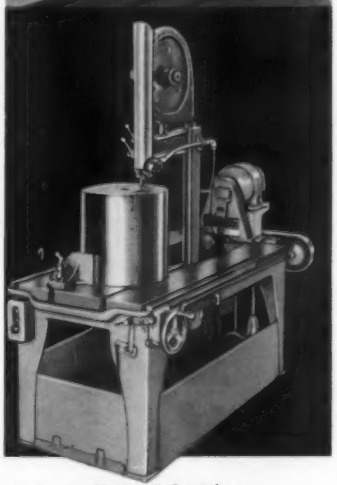
MARVEL NO. 8 BAND SAW makes a tough job EASY...

FLOOR TO FLOOR IN 5 HOURS... no special jigs, fixtures or set-up required

The versatility, simplicity of operation and unmatched efficiency of a MARVEL No. 8 Universal Metal Cutting Band Saw makes it the best all-around saw you can buy.

Take the job illustrated, as an example. Three equally spaced re-entrant cuts were required to segment a large, heavy die forging. The work was merely placed on the table between the vise jaws with the first lay-out line positioned to bisect the blade. Feed pressure was set on the direct-reading scale and the cut started. On a MARVEL No. 8, the work is always stationary and the blade is fed into the work; the cutting edge of the blade is always square with the table throughout its full feed traverse, which eliminates the need for special fixtures. The pre-set Automatic Overload-Relief Power Feed kept the blade moving into the work only as fast as it could freely remove the metal; as the vertical length of the cut decreased, the blade was automatically fed faster, thus increasing cutting speed. Upon completion of a cut, the blade was rapidly returned to its starting position by a rapid traverse handwheel located at the operator's position. Succeeding cuts were made in the same manner, with the same ease and speed.

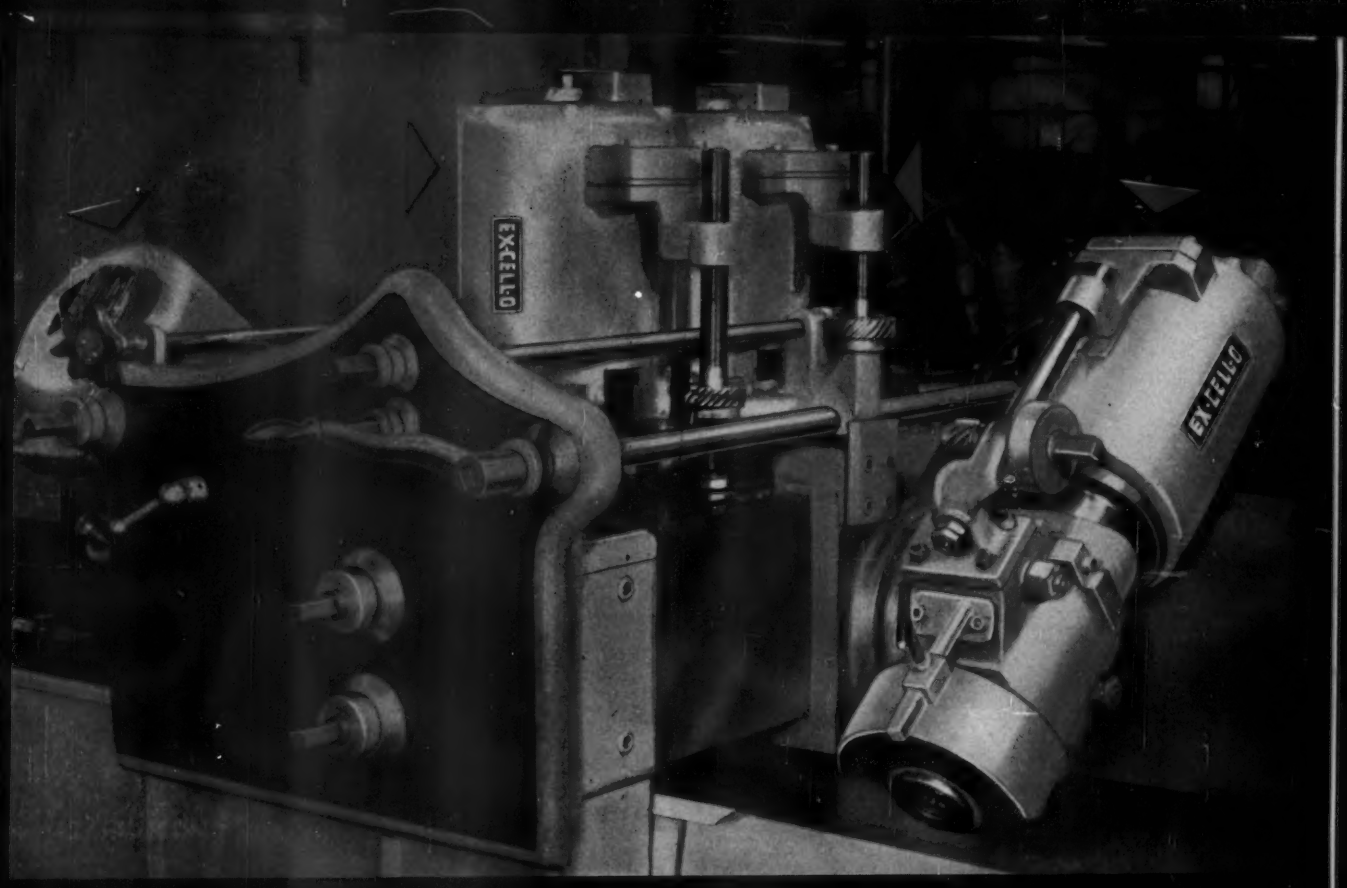
Jobs like this aren't done every day, but they serve to emphasize the versatility of the MARVEL No. 8, a truly universal metal cutting saw. If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.



ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

Metal Cutting MARVEL SAWS

S-1302



This Idea Multiplied Production by Two...

EX-CELL-O SPINDLES— AN INGENIOUS APPLICATION

A machinery builder in Kalamazoo, Michigan was faced with the problem of finish grinding both flat and angular dovetail ways on the column, knee and table of his vertical milling machines. Surface lengths varied from 9" to 24"; tolerances on flat and parallel measure had to be within .001" in 24". Workpieces were gray iron sand castings.

Conventional way to do the job—an oscillating surface grinder to work each dovetail separately. Production men thought they could improve on convention. They built up their own machine from an old planer bed, added a bridge to support four Ex-Cell-O Precision Spindles and retained the standard planer feed.

The result: grinding both sides of four dovetail surfaces in one-pass planer fashion for a saving of roughly 50 percent in per unit cost. Perhaps you too have an operation which could be performed more economically by an Ex-Cell-O Spindle; or perhaps you simply want to use the most versatile, dependable and long-lived spindle money can buy. In either case, you'll want to get in touch with your nearby Ex-Cell-O Representative, or contact Ex-Cell-O direct.

57-23

Above, four standard Ex-Cell-O Precision Grinding Spindles are utilized to grind four surfaces of machine ways in one pass.

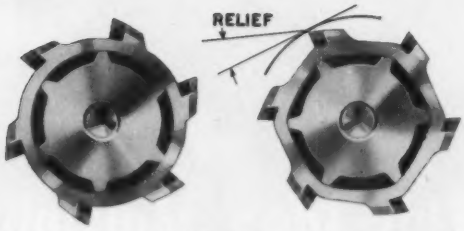
Standard, totally enclosed motorized surface grinder spindle is rated one horsepower at 3600 rpm. Also available in a range of higher horsepower.

XLO EX-CELL-O FOR PRECISION

EX-CELL-O CORPORATION

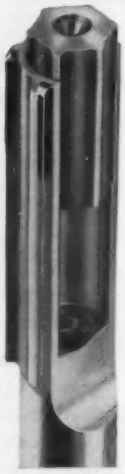
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



Bending of the tool body in expansion automatically provides clearance.

With Each Expansion, You Get A New Cutting Edge



There's extra rigidity and accuracy in these Staples Expansion Reamers. Tool bodies are solid—not split. Expansion plugs, contacting well beyond the rear of the tips, apply uniform parallel pressure.

. . . Write for a catalog of Staples Precision Carbide Tools.

Staples
CARBIDE TOOLS

THE Staples TOOL COMPANY

2352 Glendale—Milford Road, Evendale, Cincinnati 15, Ohio

DIAL CONTROL OF SPINDLE SPEEDS AND TURRET TOOL FEEDS ...

Specifications and Major Features of 1⅜" and 1⅝" Model AB CLEVELAND DIALMATICS

	1⅜" Model AB	1⅝" Model AB
Max. Round Bar	1⅜"	1⅝"
Max. Hex. Bar	1³⁄₁₆"	1¹³⁄₃₂"
Max. Square Bar	³¹⁄₃₂"	1⅛"
Horsepower	7½	7½
Idle Motion Time	6.3 secs.	6.3 secs.
Stock Feed Stroke	9"	9"
Turning Length	4⅞"	4⅞"
Dia. Tool Circle	9"	9"
No. Turret Holes	5	5
Cross Slide Travel	4"	4"
Cross Slide Tooling Width	6¹¹⁄₁₆"	6¹¹⁄₁₆"

Infinitely variable spindle speeds.
Spindle speed range—40 to 3200 R.P.M.
Cleveland exclusive quick change collet.
Quick change feedshell pads which require no screws.
Variable tool feeds through electric feed drive.
High speed Geneva turret index.
Flame hardened double cross slides.
Quick hand crank stock feed adjustment.
Universal camming and easily adjustable cam drums.

Write for new 1⅜" and 1⅝" Model AB Bulletin

gives you maximum productivity with new 1⅜" and 1⅝" Model AB

CLEVELAND DIALMATICS

Cleveland brings to metalworking another major advancement in single spindle bar automatic machine design! Now, by making *dial settings* on the control panel, you preselect the *exact* forward and reverse tool feed——and the *exact* forward and reverse spindle speed—for each of five working turret tools. Each tool is completely and individually controlled throughout the cycle . . . *tuned* for maximum cutting efficiency! There are *no change gears*. Spindle speeds are electronically controlled and infinitely variable between 40 and 3200 r.p.m. You can preselect and set 10 different spindle speeds for each machine cycle. Spindle speed changes and reversals are entirely automatic and are made through electric clutches, which make the number of changes or reversals per minute practically unlimited.

A few of many modern features of these new Clevelands are listed at left. It will pay you to get full information. Get in touch with a Cleveland sales engineer. He'll give you the full story on the many economies these new Clevelands can bring to your plant.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
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Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Production turning at 1/2 the cost!

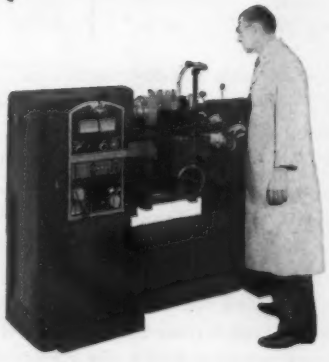
Lodge & Shipley 10″ HI-TURN Production Lathe does job of really big lathe

...and completely outperforms any other 10″ lathe!

BIG in power and production . . . BIG in speed, in rugged construction and accuracy, the Lodge & Shipley 10″ HI-TURN Production Lathe costs only ½ the price of a good 13″ lathe used for comparable work. Here are a few of the many features that put the 10″ HI-TURN in the big lathe, big value class and put it 'way ahead of *any* 10″ lathe:

FEATURE	Lodge & Shipley 10″ HI-TURN	Lathe B	Lathe C
HEADSTOCK			
Full 5 horsepower	yes		
200 to 3000 r.p.m.	yes		
All spur gear drive	yes		
Swing over bed	13¼″		
Spindle speeds	9		
BED			
Width of bed	11⅜″		
Depth of bed	11⅜₁₆″		
Hardened, ground, replaceable bedways	yes		
QUICK CHANGE GEAR BOX			
Number of quick change feeds	9		
Range of Feeds, thous. per rev.	1.5 to 24		
CARRIAGE			
Carriage length	19⅛″		
Carriage bridge width	5⅞″		
Cross slide travel	6¾″		
Flame-hardened and ground cross slide ways	yes		
TAILSTOCK			
Tailstock spindle diameter	2⅛″		
Tailstock spindle travel	4½″		
MISCELLANEOUS			
Size of lathe tool	¾″ x ¾″		
Net weight, base machine	3400 lbs.		
Template type length stops	yes		

You make the comparison *with any 10″ lathe*



Compare the Lodge & Shipley 10″ HI-TURN Production Lathe with *any other* 10″ lathe . . . even with 13″ lathes. If you don't need additional thread chasing facilities, it's the lathe for you!

Get complete details now. Write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Your Lodge-ical Choice for low-cost high-production

Lodge & Shipley

100%

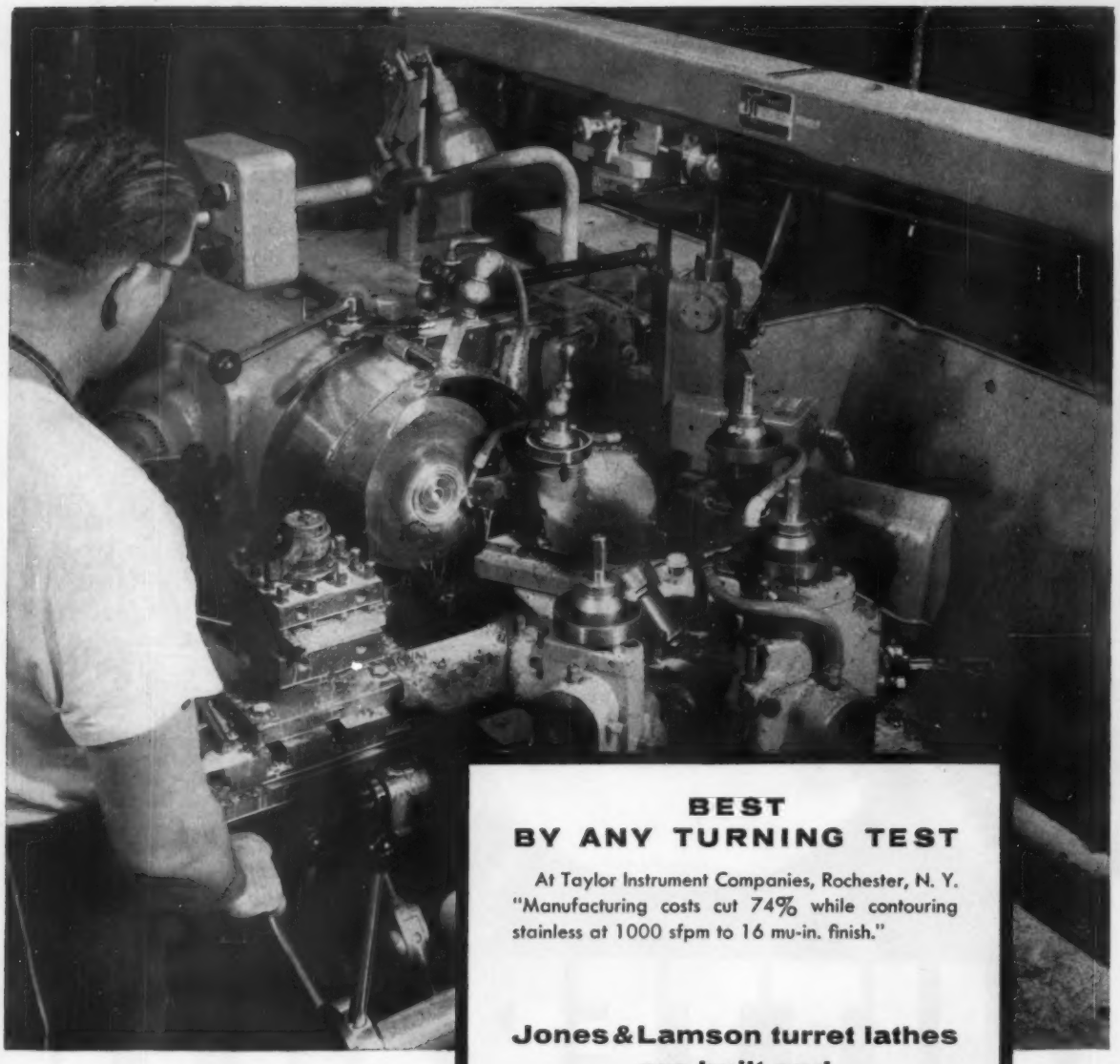
BUTTERFIELD

100% Complete Line . . . Every Tool 100% Inspected

and you get 100% SERVICE

FROM YOUR BUTTERFIELD DISTRIBUTOR

Butterfield also offers a complete line of taps, dies, drills, reamers, cutters, end mills, hobs and carbide cutting tools. There are Butterfield warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York, San Francisco. **BUTTERFIELD DIVISION** • Union Twist Drill Company • **Derby Line, Vermont.**



BEST
BY ANY TURNING TEST

At Taylor Instrument Companies, Rochester, N. Y. "Manufacturing costs cut 74% while contouring stainless at 1000 sfpm to 16 mu-in. finish."

Jones & Lamson turret lathes are built and powered to produce...

MORE CHIPS per tool
MORE PIECES per hour
MORE PROFIT per job

than any other turret lathe of comparable size!

Write Jones & Lamson for details

JONES & LAMSON

the man who needs a new machine tool is already paying for it

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.

If you're in a hole . . .

BECAUSE OF GRINDING WHEEL PROBLEMS, there's an easy way to get back on top of the situation. Switch to CINCINNATI (PD)° WHEELS. *Now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can *save you money . . . and* increase your production.

It doesn't take any digging to find out *why* everybody's talking about (PD) WHEELS. Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

°Trade Mark Reg. U.S. Pat. Off.

So, if you want back on solid ground again, see your CINCINNATI Grinding Wheels Distributor. He'll be glad to explain how (PD) WHEELS can save you money and increase production. Or, contact us direct and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you (PD) POSITIVE DUPLICATION.

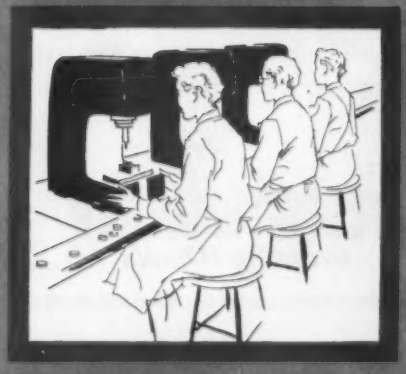
CINCINNATI° *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

PRODUCTION MEN!

TRY THIS MONEY SAVING PLANT FOR 30 DAYS WITH-

CUTS YOUR TOOLING COSTS. Many shop operations can be simplified because you can move Multipress quickly and easily from department to department, wherever a press is needed. And, because Multipress can be moved around, it can be stored in your tool crib complete with tooling setup until the particular production job is run again.



DESIGNED FOR AUTOMATION. Simplifies automatic operations. Multipress is specially engineered for automation, can be mounted around dial tables and indexing fixtures or arranged for straight line production. Multipress controls can be actuated electrically, pneumatically or hydraulically from external sources making it easy to interlock with other automatic operations.

That's right! You can put this hydraulic Multipress to work on your own press jobs . . . now . . . on a 30 day trial basis.

If you are satisfied it will save you money, boost your production, or build better quality in your work . . . then send us your check.

If you are not satisfied . . . ship the press back to us.

We will pay the return freight. You pay only the freight from the factory to your plant.

This offer is good in the U.S.A. and is for a limited time only.

HERE'S WHAT THE MULTIPRESS GIVES YOU:

- **Dependable production.** Ram pressures up to one ton . . . quickly set . . . duplicated on every stroke.
- **Fast cycle time.** Up to 150 ram strokes a minute.
- **Safe operation** with interlocked controls.
- **Easy installation.** Operates on 110 volt, single phase. Also available in 220 volt or 440 volt line.
- **Low investment.** Sells for only $395 F.O.B. factory . . . lowest priced hydraulic press anywhere.
- **Immediate delivery** from our factory or regional branch warehouses . . . subject to prior sale.

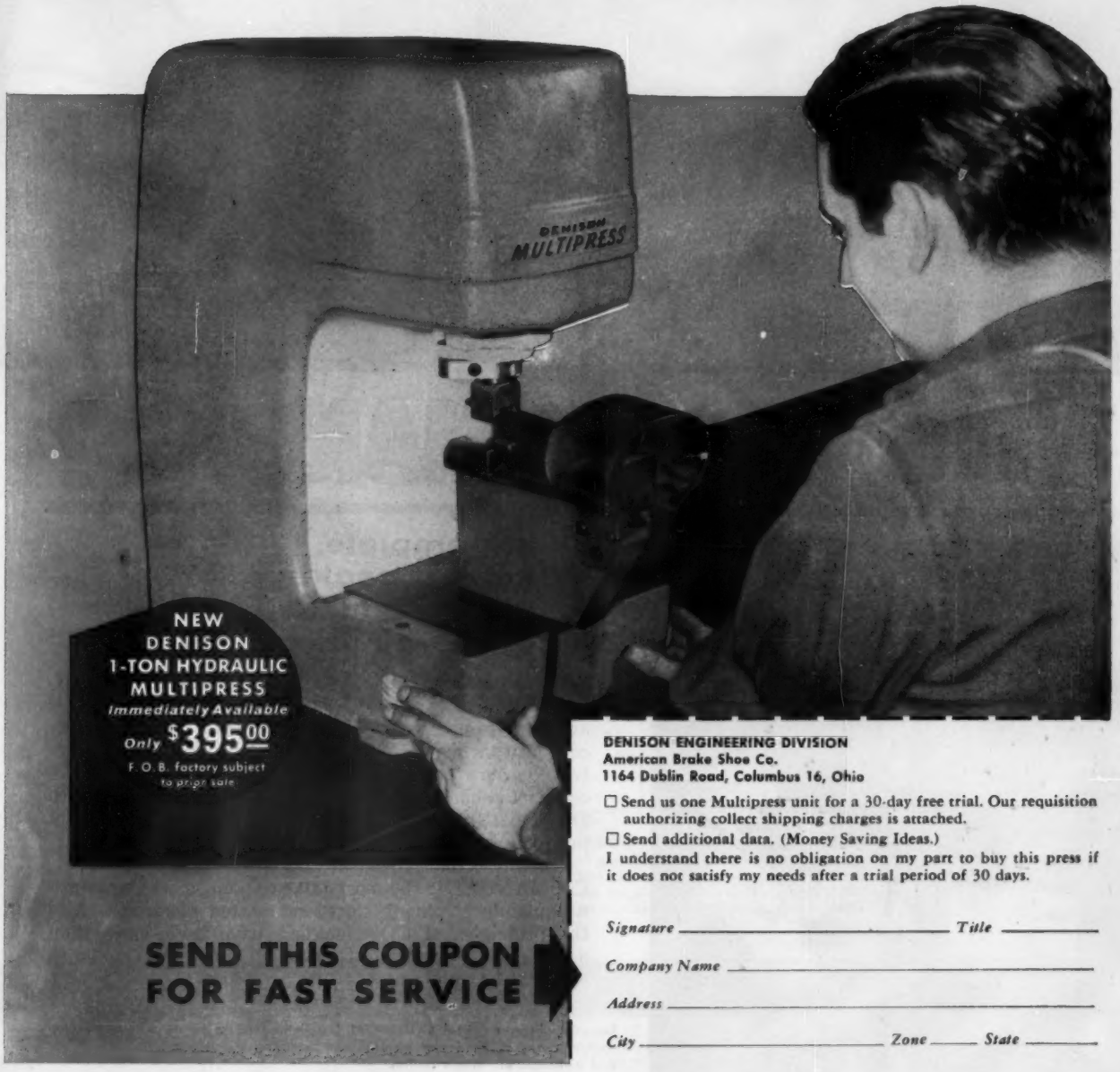
DENISON ENGINEERING DIVISION

American Brake Shoe Co.

1164 Dublin Road • Columbus 16, Ohio

DENISON HydrOILics

HYDRAULIC PRESS IN YOUR
OUT COST OR OBLIGATION



SEND THIS COUPON FOR FAST SERVICE

DENISON ENGINEERING DIVISION
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Welding correspondent visits A. O. Smith

gets low-down on industry's most talked-about new development . . . views time-cost studies . . . comes up with revealing answer to question — —

What about C-OMANUAL ?

It's a complete, integrated package for gas-shielded (CO_2) semi-automatic hand gun welding.

Introduced to production early in 1956, C-OMANUAL is A. O. Smith's answer to the need for a fast, economical and easy-to-use semi-automatic welding process. It incorporates a new featherweight hand gun, portable control console and an A. O. Smith power source. The entire compact package requires only a few square feet of space and is perfectly adapted to an extremely wide range of production or special job requirements.

Already proving itself in plants throughout the U. S., C-OMANUAL is the most talked-about, most important welding development since the coated electrode. And the principles of CO_2 shielding have been more than adequately proved by C-OMATIC, the A. O. Smith automatic welding process.

Reporter observes typical C-OMANUAL installations as operator explains ease of hand gun manipulation featuring visible arc and automatic arc length control.

It's EXTREMELY EASY to set up, use and operate... makes changing wire sizes a breeze.

With C-OMANUAL, the welder merely sets the proper current on the rectifier, pushes a start button for power. The hand gun automatically compensates for arc distance variations, and the portable control console is right at hand for fine adjustments. There's no flux to clean, no slag to remove. And the visible arc lets the welder see his work at all times.

WIRE: A. O. Smith has developed wires that will make sound, strong welds on all commercial steels currently in use—rim, semi-killed or killed. The characteristics of the wire include tolerance for the presence of oils, lubricants, scale, foreign material, etc.

The console features easy-to-read, conveniently grouped controls. Large, easy-opening doors swing out for fast, simple wire reel changing. In demonstrations at various welding shows, welders were making highly satisfactory welds the first time they used the C-OMANUAL process.

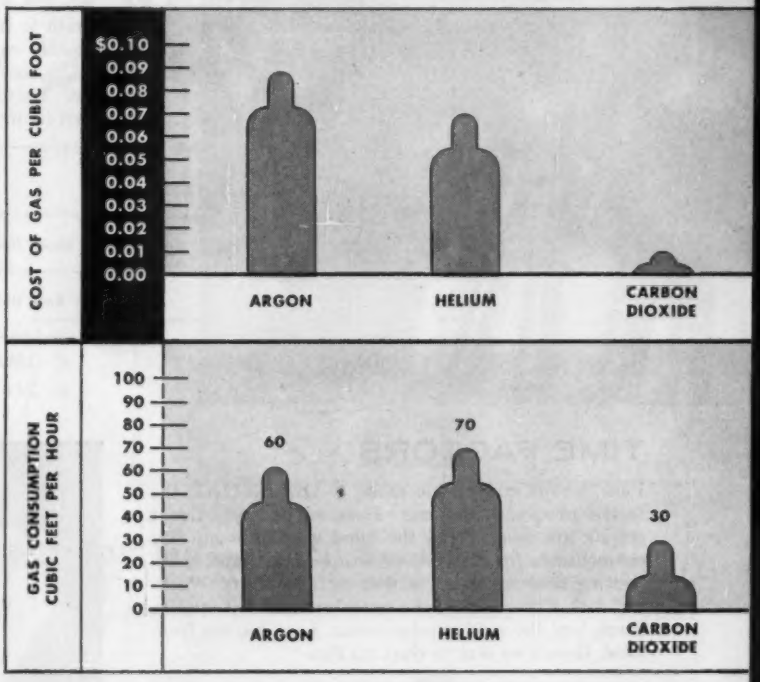
Carbon dioxide is the most efficient, economical of all shielding gases.

Lab tests, confirmed by numerous users, indicate radiographically sound welds with mechanical properties equal to the best produced by coated electrodes or by any other welding process. Tests were conducted on single, double and multi-pass butt welds . . . longitudinal, circumferential, positioned fillets and on plug and 3 o'clock welds. All were completely satisfactory.

And, as you can see in the charts at right, C-OMANUAL saves thousands of dollars annually over other shielding gases.

NOTE: On the following pages CO_2 welding is compared with hand electrodes and semi-automatic submerged arc. The charts above make it apparent that the high costs of Argon and Helium eliminate them from serious consideration for mild steel applications.

The C-OMANUAL wire feed driving mechanism is contained in the console and is easily accessible. The changing of wire reels and unit inspection is extremely simple. 60-lb. coils of any diameter are self-contained in the console. Special provision for economy "pay-off" packs can be made for large users.



Charts show comparative cost per cubic foot and relative consumption rates of Argon, Helium and Carbon Dioxide. Prices are based on standard-size cylinders. For users who'll want to use C-OMANUAL extensively, CO_2 in liquid form can be purchased in bulk storage tanks, converted to gas and piped into the job for less than half a cent per cubic foot.

SEE FOLLOWING PAGES FOR TIME AND COST COMPARISONS

A. O. SMITH CORPORATION, Milwaukee 1, Wisconsin

How C-OMANUAL three other

whatever your means of measuring welding costs, C-OMANUAL comes out on top

To spotlight the tremendous advantages offered by C-OMANUAL, A. O. Smith ran tests against submerged-arc (semi-automatic) process and the two types of stick electrodes usually used for jobs of this type. Box at right gives set-up information on tests. Data pertaining to "manual submerged-arc" in all following charts was compiled from manufacturers' operation manuals.

SET-UP DETAILS ON IDENTICAL ¼", 100-FT FILLET WELDS

	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Electrode	1/4"	7/32"	5/64"	1/16" CO-86
Amps*	320	250	350	520/530
Volts	22/23	23/24	32	40/41
Polarity	a-c	a-c	Reverse (+)	Reverse (+)

*Detailed explanation of amp variations involves the lengthy theory of C-OMANUAL's High Current Density method. It suffices here to say amps tabulated are estimated as normal ratings for the various processes on this particular job.

TRAVEL SPEEDS AND METAL DEPOSIT RATES

In addition to inherent speed, C-OMANUAL gives the operator a visible arc. He can fully utilize its high speed and fast metal deposit because he just pulls the trigger, follows the joint until the weld's complete. There's no need for stops to check his progress, no interruption when he moves from pass to pass.

Chart I

	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Travel Speed (ipm)	12.5	18.5	21.4	40.0
Deposit Rate (lbs/hr)	6.65	9.81	11.4	21.0

C-OMANUAL is 84% to 220% faster . . . deposits 87% to 216% more metal per hour than other processes

TIME FACTORS

Four factors combine to make C-OMANUAL the fastest process in its class. First, set-up and current setting are easy. Next, the hand gun automatically compensates for distance variations, eliminates time-wasting trial-and-error as well as false starts. Working with a visible arc, the operator need not stop to check how the weld is progressing. Last, but far from least, there's no slag to chip, no flux.

Chart II

Time (hrs.)	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Arc	1.590	1.080	0.930	0.500
Electrode Change	.075	.066	—	—
Slag Removal	.130	.084	0.120	—
Total	1.795 (1 hr, 40 min)	1.230 (1 hr, 15 min)	1.050 (1 hr, 3 min)	0.500 (30 min)

C-OMANUAL completes 100-ft weld 110% to 259% faster than other processes

stacks up against welding processes

COST FACTORS

The figures in the chart to the right have been compiled on the basis of the tabulations in charts I and II. All cost figures are based on an *exact* (by weight) ¼" fillet 100 ft in length. It's interesting to note that if the "overhead" or burden figure were increased, the advantage in favor of C-OMANUAL would become even more pronounced.

Chart III

Cost	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Labor @ $2.50/hr.	4.49	3.08	2.63	1.25
Overhead @ 150%	6.74	4.62	3.95	1.88
Power @ .01/kwh	.14	.08	.17	.17
Flux	—	—	1.43	—
Gas (CO_2) @ .01/ft3	—	—	—	.15
Electrodes or Wire	2.09	2.86	1.38	3.09
Total	$13.46	$10.64	$9.56	$6.54

RESULT- based on charts I, II and III

C-OMANUAL cuts total welding cost per 100 feet by 31% to 51%!

The Wire...

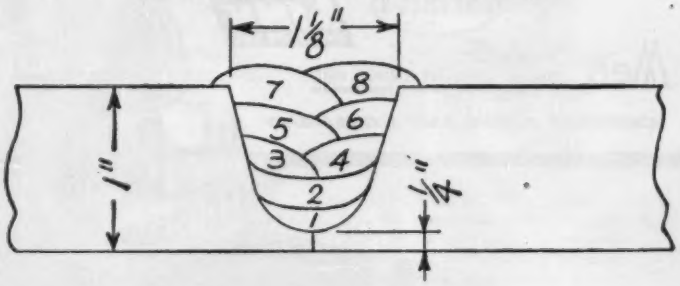
The most popular C-OMANUAL wire is CO-86 — an exclusive A. O. Smith development.

CO-86 produces a weldment with physicals comparable to those of the finest Low Hydrogen electrodes.

It has the ability to weld through oil and rust and can be successfully used on many off-chemistry and hard-to-weld steels. It will tolerate some high sulphur and high carbon steels.

All-weld Metal Test Coupon - 1020 Steel

Beads 1 thru 6 — 36 volts — 395 amps
Beads 7 thru 8 — 38 volts — 390 amps



TYPICAL MECHANICAL PROPERTIES (as welded.)

All Weld-Metal .505 Mechanical Tests

Yield Point (Drop of Beam)	Tensile Str.	Elong.	Red. of Area
57,850	73,300	31.5%	61.8%

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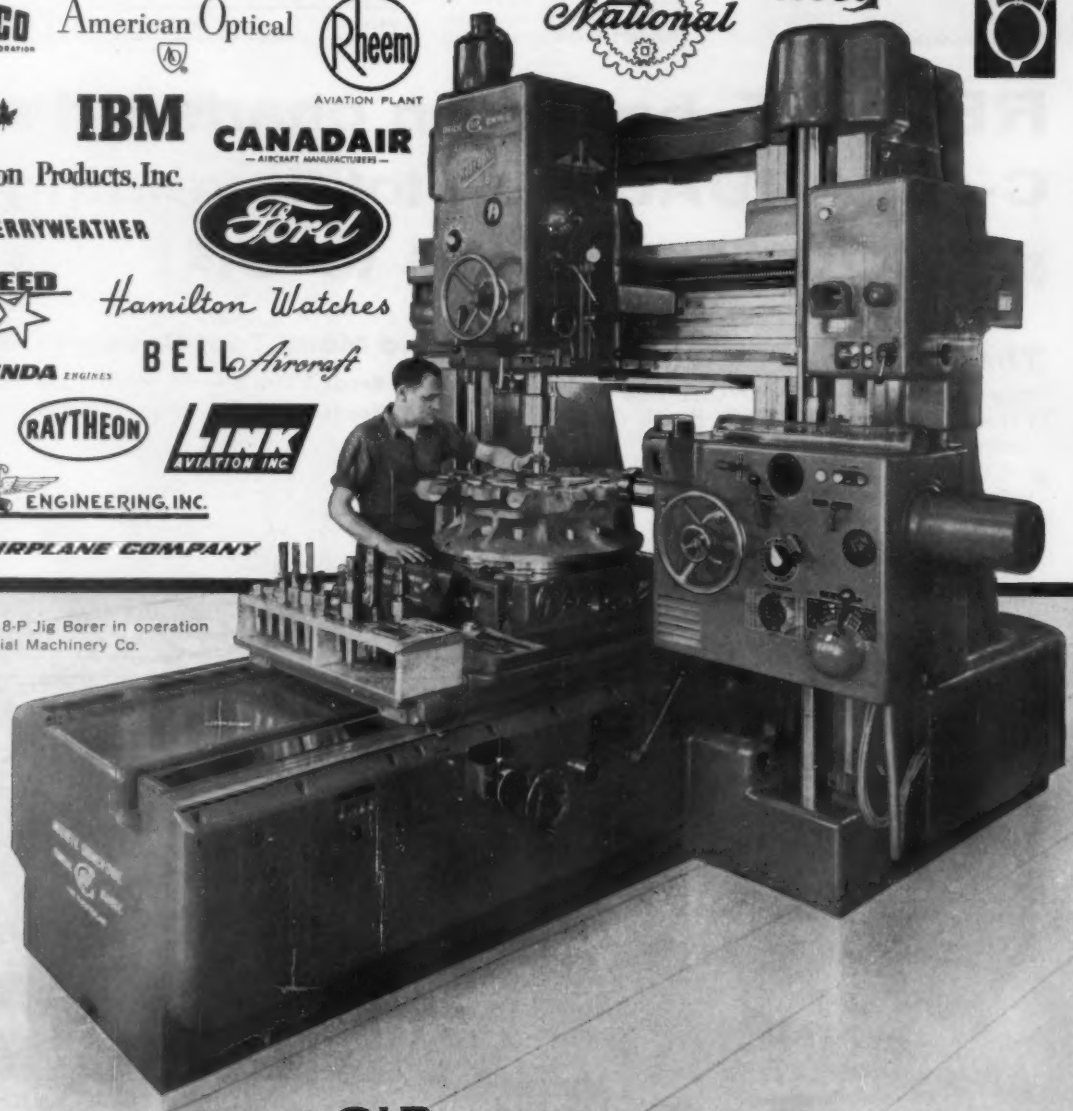

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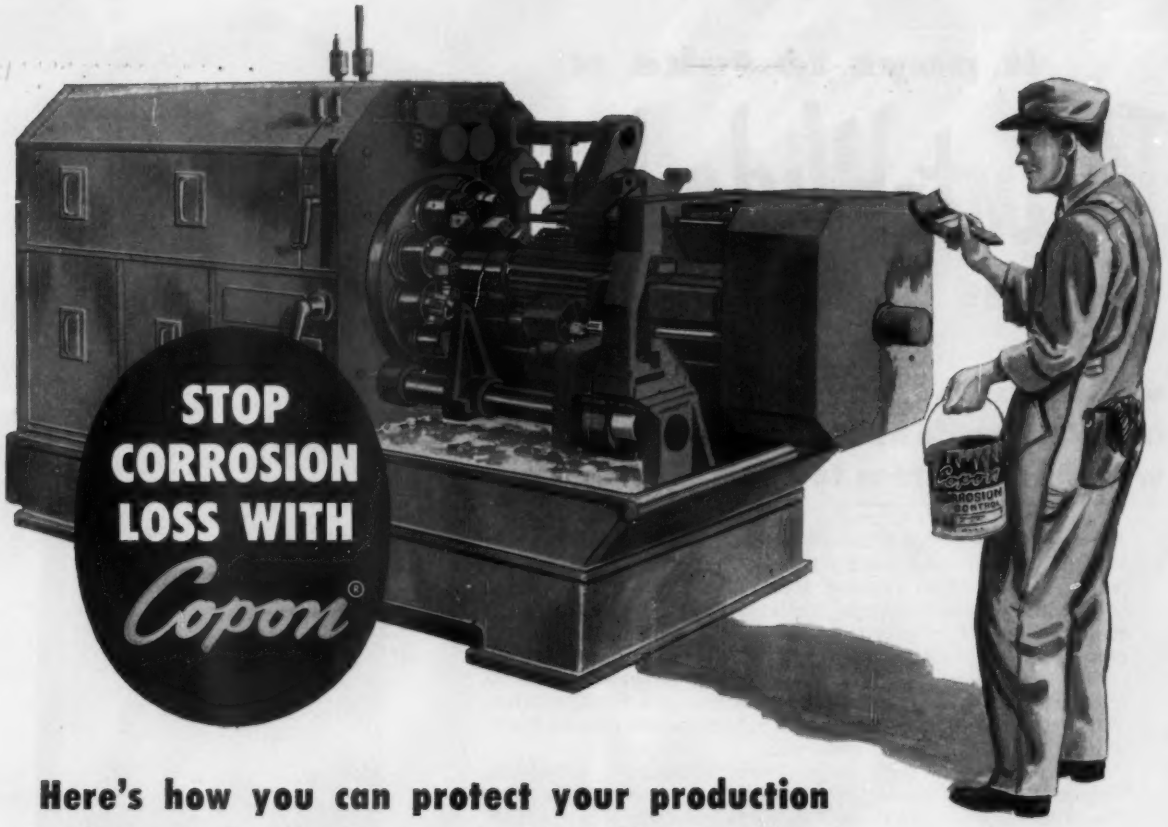

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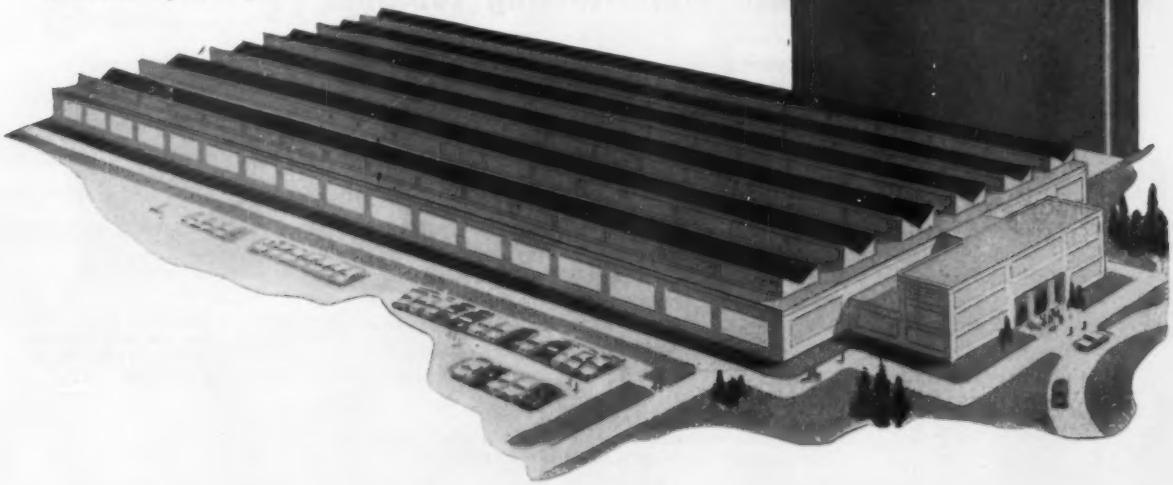

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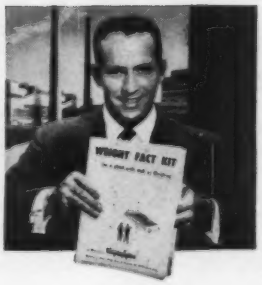

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This *"American"* Hole Wizard Radial has a right angle base, on one wing of which is mounted a Bullard Man-Au-Trol Spacer—as shown by the illustration.

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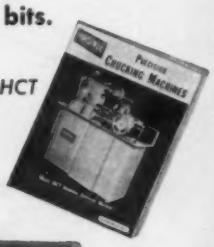

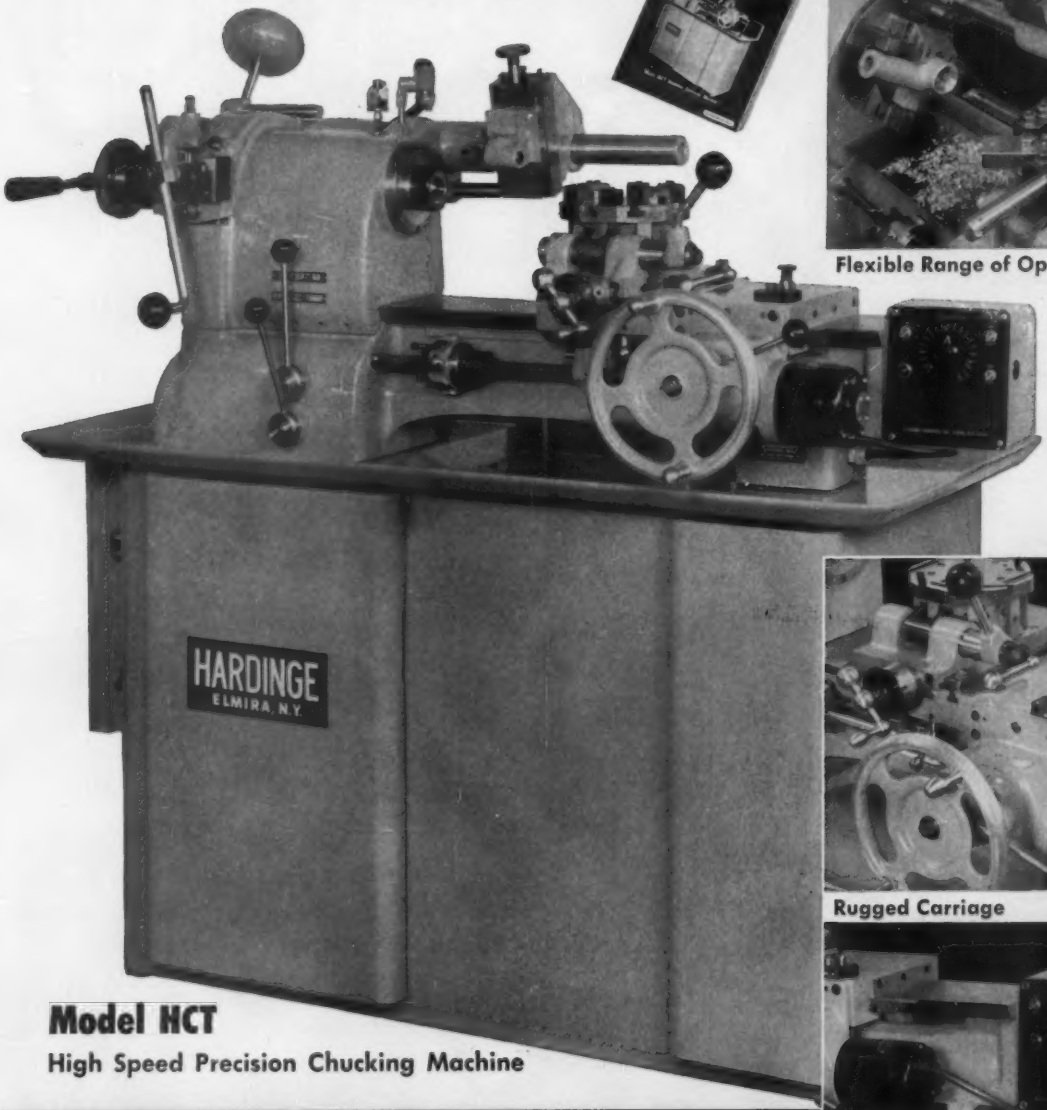

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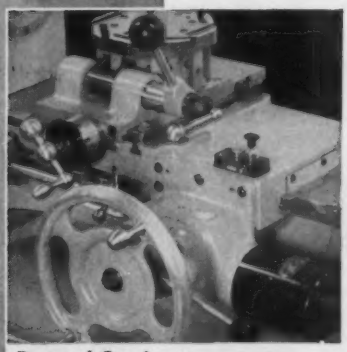
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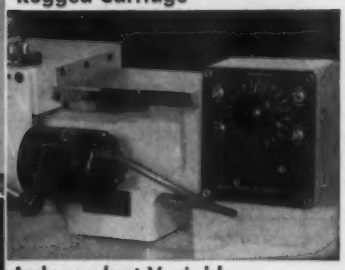
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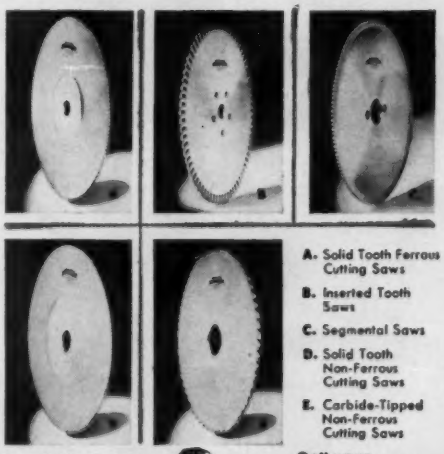

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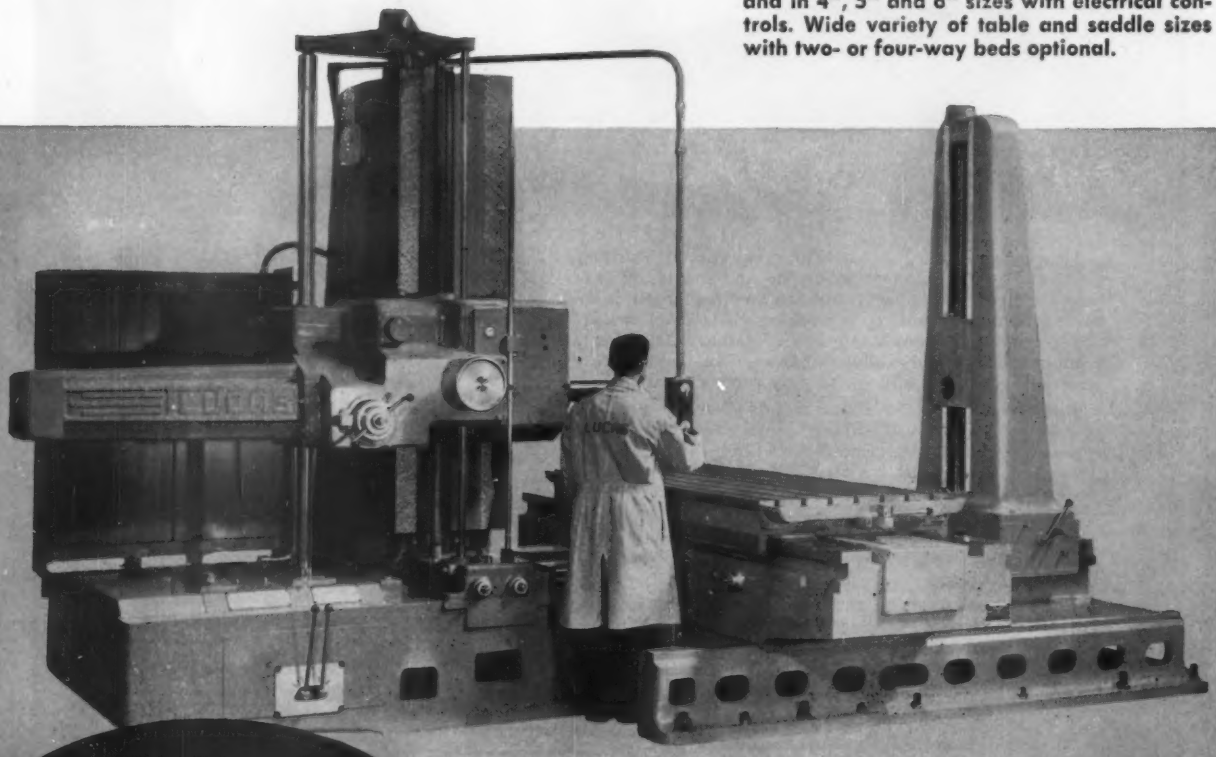

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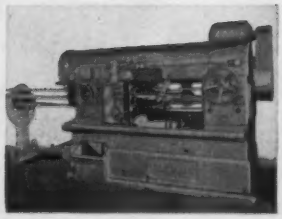

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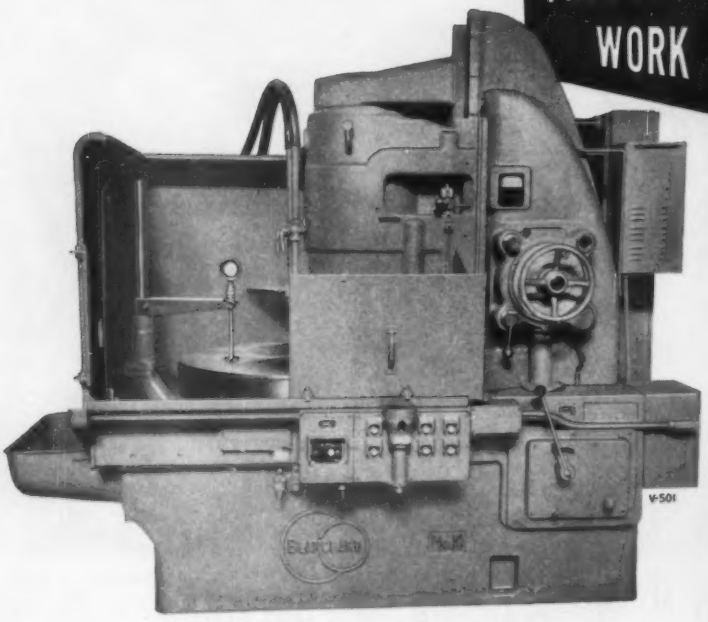
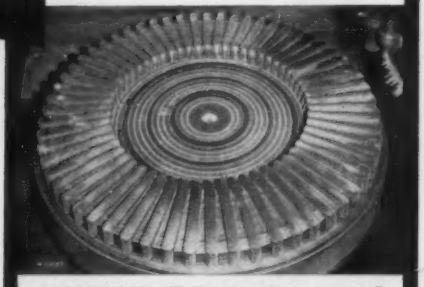


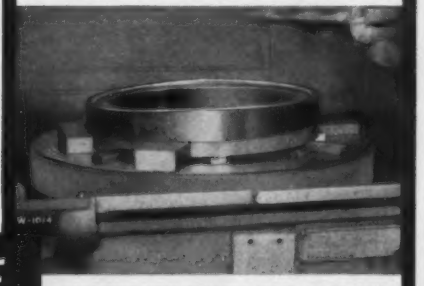
PRODUCTION WORK

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.

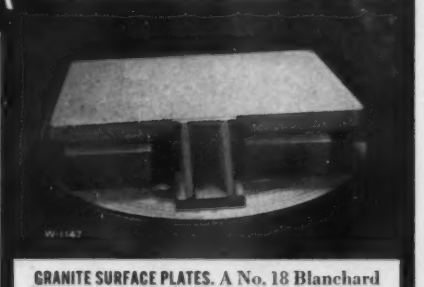


CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.



GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18" x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

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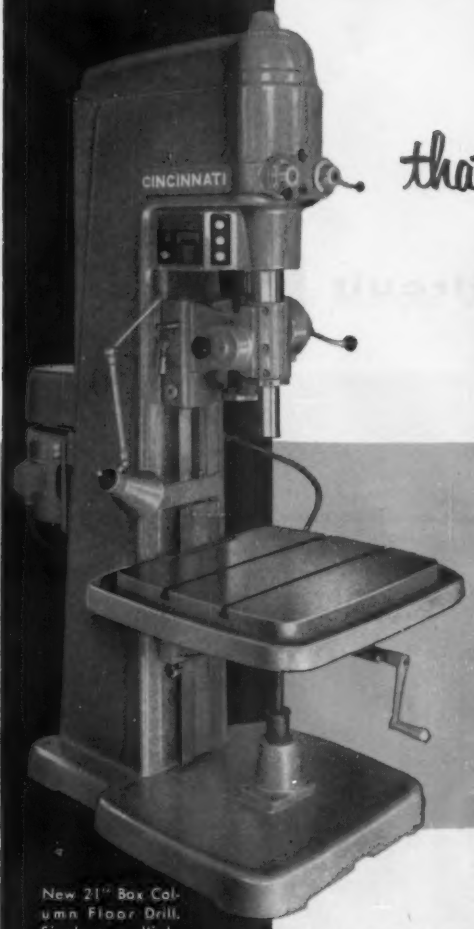

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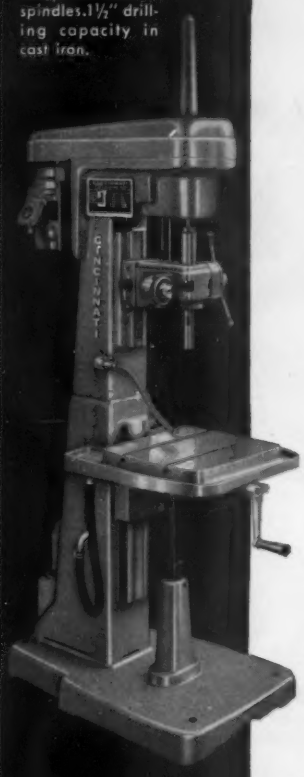
You'll speed up and improve your drilling machine operations by replacing all of your outmoded drills with these new, economically-priced Cincinnatis. See them and test them at your local CL&T dealer. Write direct for catalog data. Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, Ohio.

New 21" Round Column Floor Drill. Single spindle only. 1½" drilling capacity in cast iron.



New 16" Box Column Floor and Bench Drills. Single and multiple spindles. 1" drilling capacity in cast iron.

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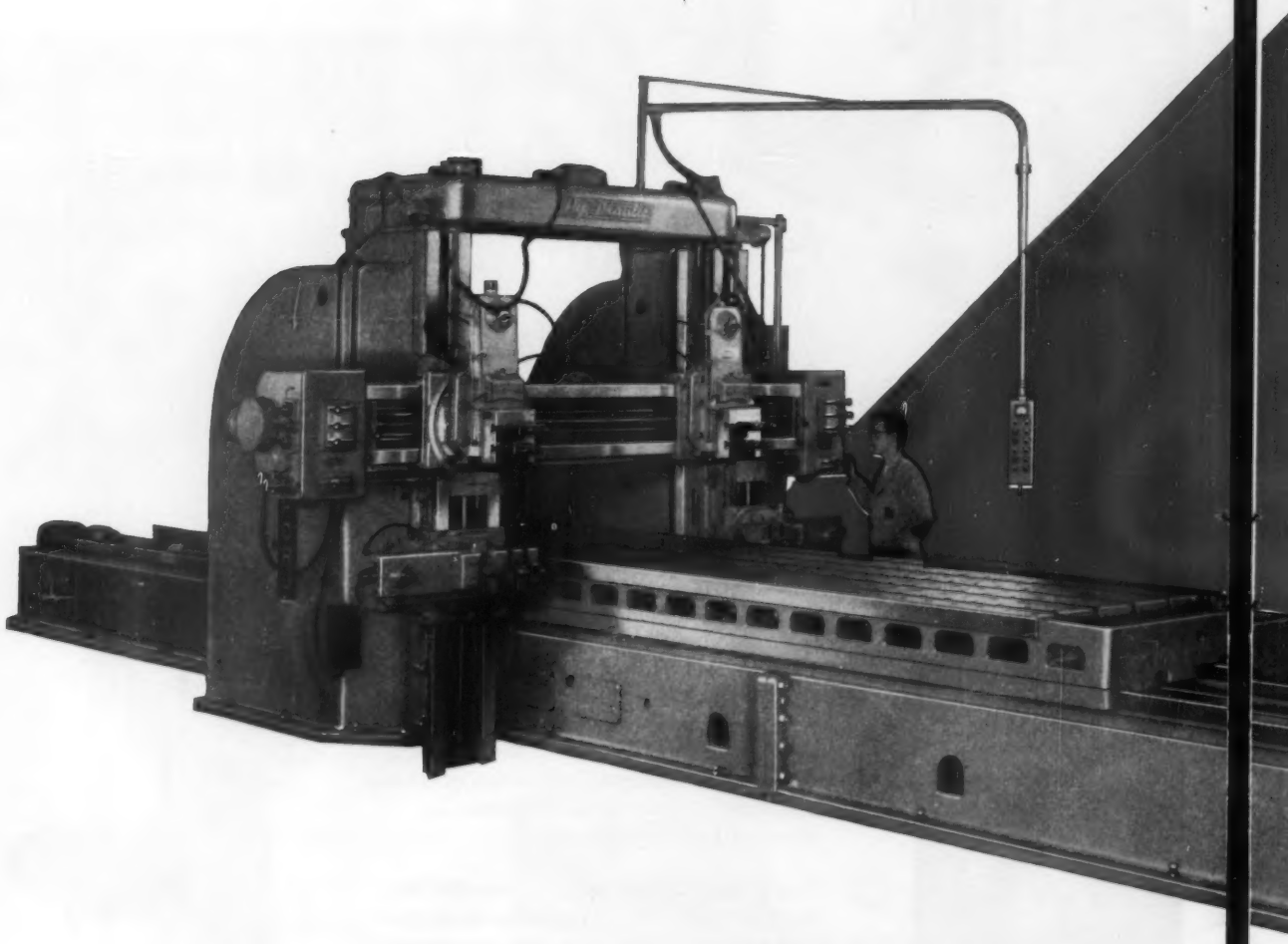
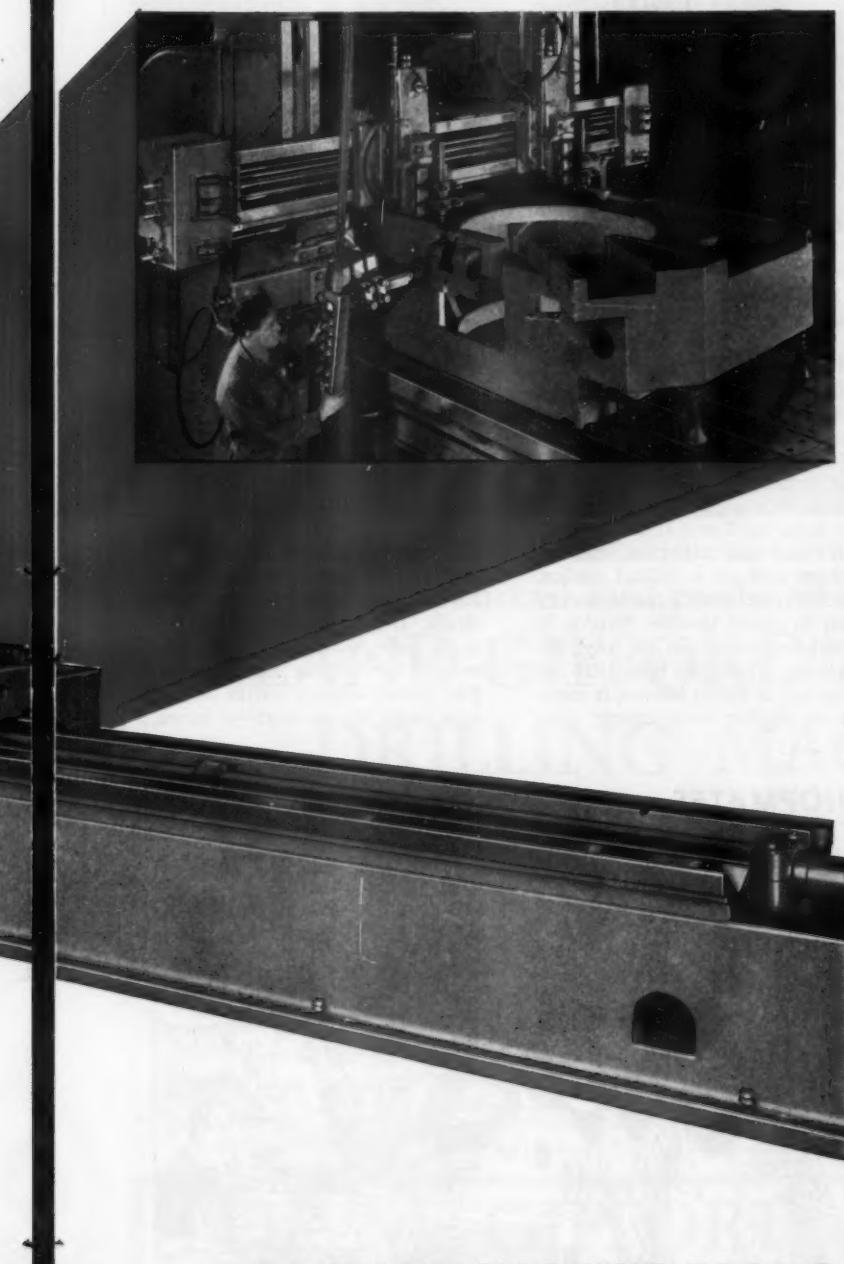
Builders of Engine, Toolroom and Fixed Gap Bed Lathes and a complete line of Drilling Machines

versatility of triple circuit h3 drive



shown with 4-TON work piece!



MACHINED ON DOUBLE-HOUSING

ROCKFORD HYDRAULIC PLANER

A Rockford Double-Housing Hydraulic Planer machines this huge casting, using carbide tools on 2 railheads and 1 sidehead. The exclusive hydraulic triple circuit supplies 3 cutting speed ranges for flexibility in changing from one kind of work to another. Pendant control offers selection of low range to 100 fpm., for extreme depths of cut and maximum feeds; medium range to 150 fpm., for average cuts in medium steel or cast-iron; or high range to 300 fpm., for carbide planing of steel and non-ferrous metals.

It is possible for an operator to adjust the h3 drive from 10 to 300 fpm. at the normal operating position, instantly selecting the speed range ideally suited for his individual job application.

See your Rockford Machine Tool Company representative for complete information on the versatility of the new hydraulic triple circuit h3 drive for your production work.

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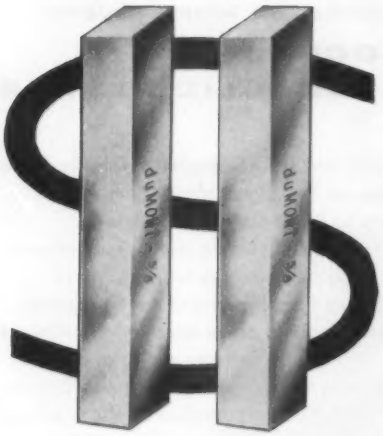
duMONT *balanced* TOOL BITS



SAVE YOU MONEY *because they* LAST LONGER

The high speed steel in duMont Tool Bits has an extra fine grain structure, is *precisely balanced* in *toughness, wear resistance* and *red hardness.* This gives duMont Tool Bits a definite edge in cutting life, gives you more cuts per bit, more cuts per dollar.

Make your own tests — compare cost and performance. You'll see why duMont Tool Bits are favored by cost-wise buyers everywhere.

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Stored Energy

Following your interesting and informative article on Shock Forming, you have a section under the title: "Some Rates of Energy Release." (AM—Jan 14 '57, p115.) My experience on the energy storage capacity of steel springs and rubber springs does not agree with what you have shown. I suggest that you investigate this subject, as the values published, if incorrect, could cause considerable trouble to designers.

In contrast to your statement, I find that a steel bar in direct tension is a very good spring. Based on music wire with a yield stress of 200,000 lb per sq in., I find that it will absorb 196 ft-lb per lb. This is considerably different from the 7 or 8 ft-lb reported.

It was also reported that, in torsion and as a helical spring, the bar can absorb more energy than in direct tension. This is in direct contradiction to my experience, which has been that the steel bar in direct tension is capable of storing more energy than in any other shape. By pre-stressing, as is common practice, I find that a straight round bar in torsion can absorb 150 ft-lb per lb, and as a coiled compression spring, 125 ft-lb per lb.

The paragraph discussing rubber band motors for early flying machine models, although true, is highly misleading. My experience with rubber springs, such as used commercially as shock nuts, is that energy storage capacities of the order of 5 to 10 ft-lb per lb are all that are practical. The much higher energy storage reported can be obtained only at the sacrifice of dimensional stability resulting in creep.

R I Gardner
Consultant in Mechanical Design
Northridge, Calif

Reader Gardner is right in saying 196 ft-lb per lb, if we assume 200,000 psi as a safe working stress. If we assume 40,000 psi as a safe working stress, the answer is 8 lb as we reported. The stored energy varies as the area under the stress-strain curve,

SHOPMATES

N. Jarvis

... SOME KIND OF NEW CUTTING OIL HE INVENTED ... GOT OLIVE OIL IN IT !!
HE COULD'A AT LEAST TOOK THE SARDINES OUT OF IT FIRST ... I'M GETTIN' SICK !!
HE'S ALWAYS INVENTIN' ... REMEMBER WHEN HE PUT THE HAIR OIL IN THE GEARBOXES .... AND ALL THE GEARS GOT CURLY ??
.... AND THE WHIP PUT A PERMANENT WAVE IN HIS PAY CHECK 'TILL HE GOT 'EM ALL PAID FOR !!
N. JARVIS

COMPLEX DRILLING PROBLEMS?

Here's how Belock Instrument Corp. solves theirs with modern punched card production control and . . .

LELAND-GIFFORD *Multiple Spindle* DRILLING MACHINES

Belock Instrument Corp. of College Point, N. Y., builds fire control systems, bomb sights, radio frequency tracking equipment and other precision electronic and mechanical equipment. Some of these units have as many as 7000 precision parts.

To keep on top of their complex production drilling operations, Belock employs an IBM punched card system to budget machine time and to schedule related operations for maximum machine utilization.

At the business end of this modern production control system is this battery of Leland-Gifford Multiple Spindle Drilling Machines. Each job goes to the right machine where the right tools are ready for use, in the combination called for, with the right speed instantly set and checked by the Leland-Gifford indicating shift. Centralized controls and built-in safeguards against costly errors also help to speed work flow.

Always preferred for precision drilling, today's Leland-Gifford machines offer you even more in performance, economy and efficiency. New bulletins describe the latest time-saving, cost cutting features. Write for them.

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- Raw materials available from nearby sources

TEXAS POWER & LIGHT COMPANY

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FIDELITY UNION LIFE BUILDING • DALLAS, TEXAS

which makes the substantial difference between 8 and 196. The stored energy would be even larger if aircraft grades of high heat-treat steel at 280,000 psi were used for the calculation.

The acceptable safe stress will obviously vary with the steel and the conditions, but for most practical purposes, we would think a bar at 40,000 psi would be a safer standard than music wire at 200,000 psi or thin aircraft sections at 280,000 psi.

We agree that the stored energy figures for rubber-band motors involved creep, but for this particular application (as in many of the stored-energy applications), the important thing is the energy you can release on a one-shot basis, with or without creep—Ed.

Self-balancing Bipod?

We have come a long way from the days of the galley slaves, and our progress in improving labor-management relations and working conditions has been truly gratifying at times. Yet, in the final analysis, it is hardly understandable that in many industries, the most important aspect in management, affecting these relations, affecting production, affecting our future as a whole—the human re-

Helpful Henery

by L. Hoppes

"I moved your lunch bucket over there where it's out of the way while I'm cleaning!"

lations aspect—is still management's most neglected phase.

One reason is that supervisors keep forgetting, in many cases, that when they hire a man, or supervise a man, they are not merely hiring or supervising a pair of hands, eyes, and ears, but the whole human man, a beautifully complex and marvelous system of capillaries teeming with attitudes, emotions, feelings, fears, frustrations, hopes, desires—a "self-balancing bipod," but also a person that requires more studying than the most complex of industrial machines.

We are dealing with men who come to work burdened down, many times, with failures, disappointments, and financial and family worries which they cannot park outside the workshop door as they can an umbrella or overshoes.

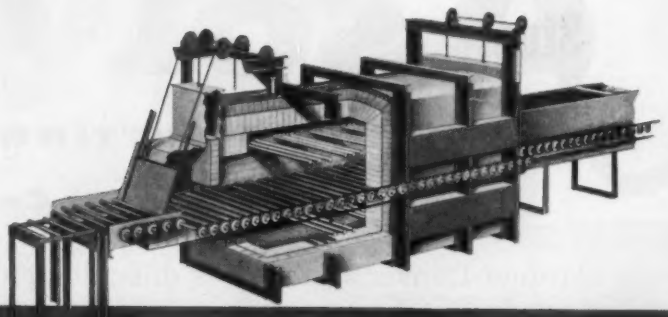
The emphasis in today's trend is on the study of the inner man rather than on the study of machines. And we should place particular emphasis on "getting along with people," rather than on "getting ahead." Truly, the art of getting along with people might be classed as one of the lost arts of our day.

Happily though, some firms are beginning to realize that the study of man, of human nature, supersedes the study of machines. The practice of the applied science of human relations can be compared to the discovery of uranium, so far-reaching and beneficial are its effects when used in daily contacts.

G. McArdle
Philadelphia

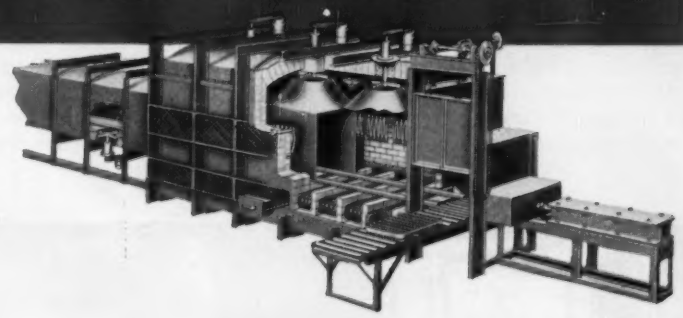
Reader McArdle's point is well-taken. There is a great need for better understanding among people, not only in industry, but in every phase of life. As pointed out frequently in the pages of American Machinist, *modern scientific management recognizes this need. More and more companies are coming to realize its importance, and many are now training their supervisors to be aware of the different drives and reactions of different people. At one time it was thought by the supervisors that these courses were nothing more than "charm schools." On the contrary, in most cases they are based on sound psychological principles, and their aim is to teach the supervisor to understand his employees to deal appropriately with each of them*—Ed.

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT



LET'S TALK ABOUT

the economy of electric heating



Low initial cost—simplified maintenance—efficient use of heat.

All these represent good reasons why electric heat treat furnaces are important considerations. For example, gas-fired and electrically-heated furnaces are frequently competitive; in fact, when total installation cost figures are considered, electric furnaces often have the price advantage.

Upkeep is reasonable, too, because properly designed and installed electric heating elements are so easy to maintain and adjust. Elements are quickly removed for repairs.

Electric heat is more efficiently used for applications in the high temperature range. There is a considerably smaller heat loss in the use of electricity than gas—shrinking the price spread between the two. To be specific, a thorough study must be made of all factors: local power and fuel costs, production demands, quality control standards, etc., before any final decision can be made of the type of heating to be used. Holcroft will help you—a good place to start is to send for our new book **Holcroft and the Electric Furnace.** It's yours without obligation.

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Stuart SOLVOL

LIQUID CUTTING COMPOUND

Lubricates as it Cools

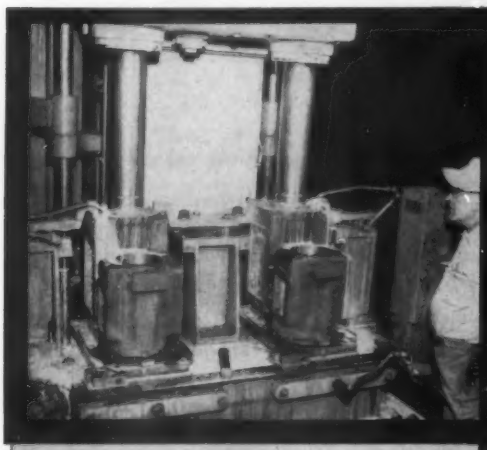
Keeps Gardner-Denver Company's difficult production jobs "right at peak"

"Solvol prolongs cutting-tool life . . . increases production . . . reduces costs . . . and keeps production right at peak," —that's the report from Gardner-Denver Company, Quincy, Illinois, where Stuart's Solvol is used as a multi-purpose cutting oil to produce profit-boosting benefits ordinary "coolants" can't give.

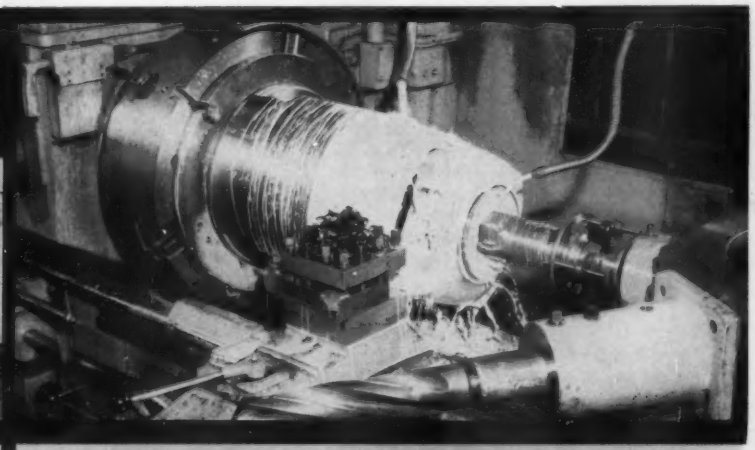
Solvol's excellent combination of lubricating and cooling qualities has stepped up performance on 30 different machines used for milling, drilling, turning, and boring in this manufacturer's main plant at Quincy, Illinois. The four jobs illustrated are typical of the way Gardner-Denver engineers maintain machine and cutting-tool efficiency, producing parts for compressors, pumps, rock drills, and other heavy equipment.

They are typical, also, of the way Stuart's Solvol is used in profitable plants everywhere for high-speed turning, vertical surface broaching, round hole broaching, and similar heavy-duty jobs on which water-mix cutting oils are indicated.

For Solvol *lubricates as it cools*, keeps tool wear down by providing a tough protective film of oil at the cutting edge . . . allowing chips to slide freely up the face of the tool . . . minimizing heat caused by friction on heavy cuts taken at high speeds.



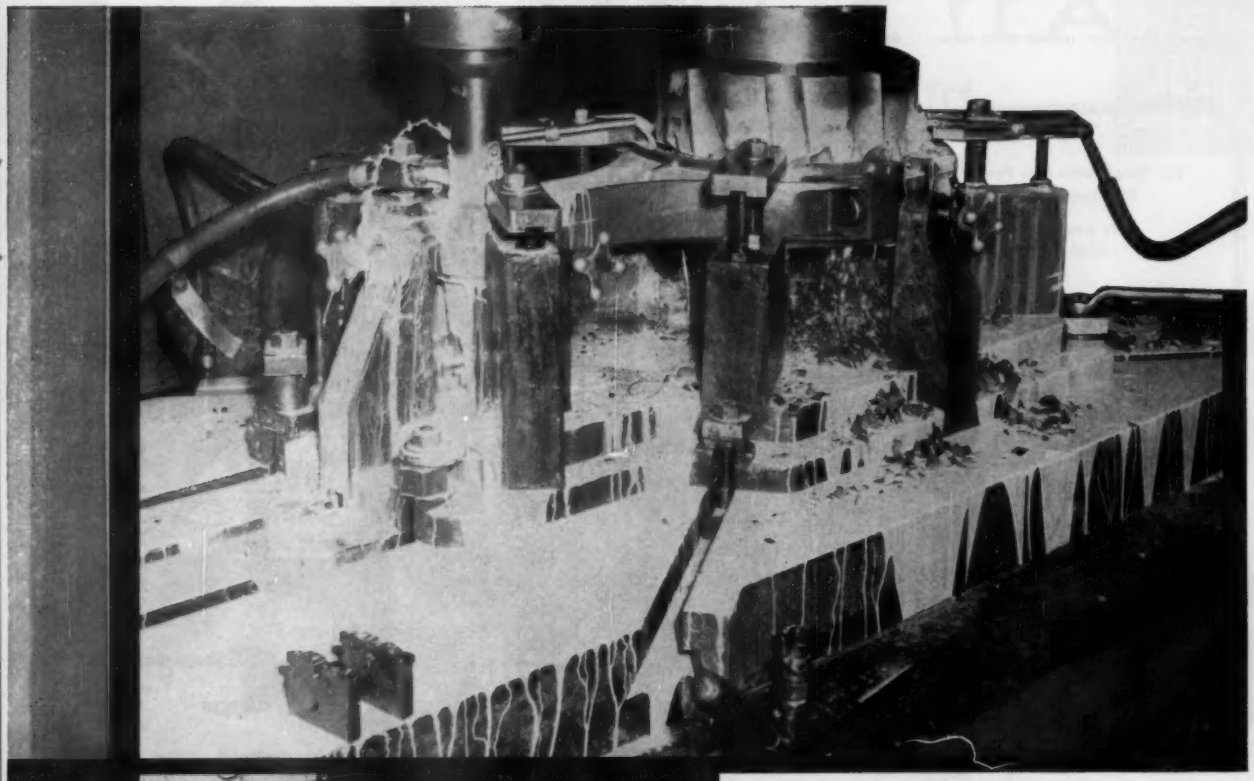
Boring operation on cast-iron compressor cylinders removes .019 in. stock. Feed is 3.5 in. per minute . . . production time, 7.69 minutes per piece. Solvol eliminates "edge build-up."



Prolongs tool life on this high-speed turning operation. Up to ¼ in. of stock is removed from these cast steel cylinder cross-heads at speeds of 300 sfpm. Standard 30-to-1 Solvol and water *absorbs heat rapidly and reduces friction for good utilization of power without excessive tool wear.*

SOLVOL helps you cross the heat barrier in metal-cutting

Stuart's Solvol liquid cutting compound controls the heat problem more effectively on practically all high-speed metal-cutting operations. Each ingredient of Solvol was chosen for specific qualities which prolong cutting-tool life . . . protect machines . . . maintain high standards of accuracy and finish . . . and assure greatest on-the-job economy. Solvol has high detergency plus superior emulsifying and rust-inhibiting qualities. Heavy-duty pure fatty oil increases surface wetting characteristics and boosts the lubricating factor of the petroleum base. Experience-proved emulsifiers increase stability and prolong Solvol's effectiveness. Standard starting mixture is one part Solvol to 30 parts water . . . other mixtures are used to meet unusual requirements. Your Stuart sales engineer will be glad to give you specific recommendations that reduce your operating costs and step up performance.



Tough milling job upgraded by Solvol's lubricating, cooling, and anti-rust qualities, machining two bores in heavy cast steel connecting rods (above). No chip "weld" on cutting edges... *lubricating and rust-inhibiting* qualities protect machine and fixtures. Pregrind operation removes up to .010 in. stock from each bore. One rod finished to within ± .002 in. every 33 minutes.

Carbide-tipped face mill takes heavy cut on this large slush pump connecting rod. Solvol withstands high unit pressures... provides *a tough film of lubrication* to reduce friction and prevent excessive heat build-up.

Phone your
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Arrange now to test Stuart's Solvol on your difficult metal-cutting jobs.

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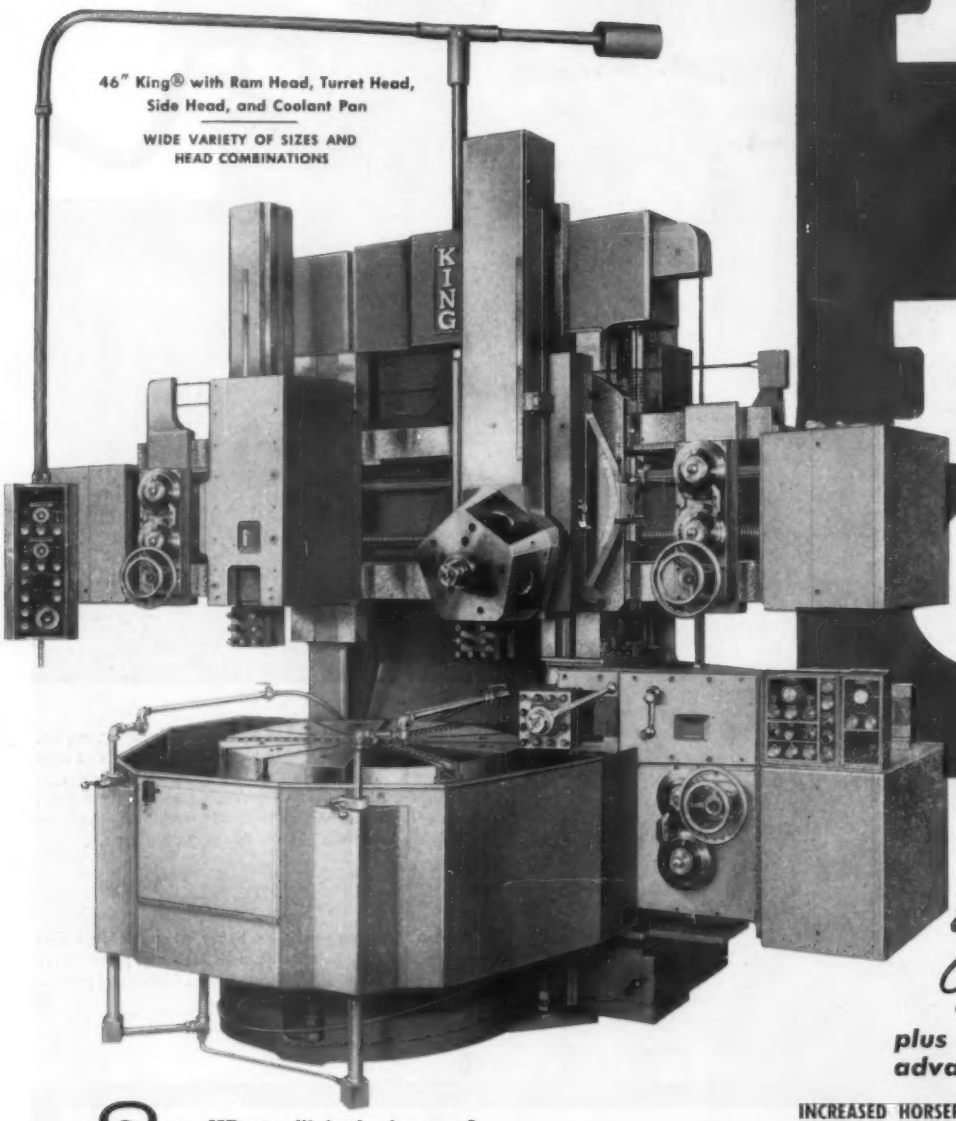

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24 feeds from .0016" to .250" per revolution. 24 speeds in any one of three standard ranges —low, intermediate, or high.

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—provides maximum table stability.

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KING VERTICAL BORING & TURNING MACHINES

Spot news...

- **ASTE will hold a Tool Show every year starting in 1960**—actually two shows on even-numbered years, the regular Tool Show and the West Coast one. Tentative schedule: Philadelphia and Los Angeles in 1958, Detroit and Los Angeles in 1960, Philadelphia in 1961, Detroit and LA in 1962, Chicago in 1963, Detroit and LA in 1964, Philadelphia in 1965, Detroit and LA in 1966.
- **Look for Chevrolet to add a new model to compete with Ford's Edsel** and the super-Mercury ("Olympia"). Called the "Impala," it'll be a cut above the BelAir.
- **Conversion of steel machining chips directly into parts is being done at GM.** Chips are crushed, broken up into convenient sizes, washed and cold-compressed into a blank slug, which is heated to 1500 F, then extruded into the desired part shape. Details on p160.
- **Latest addition to Florida's industrial boom:** a $7.5-million expansion of Glenn L Martin Co's Orange County guided missile facility.
- **Microgrinding quills (diamond) are being used to finish small holes** (0.33 to 0.125 in. dia) in carbides, hardened die steels and ceramics—the holes having been roughed by supersonic methods or preformed.
- **Ford will spend about $52 million on its 1958 facelift.** The 1959 Fords will be all new; 1960s will be facelifts; and 1961 another big change. Swooping fenders may be dropped in favor of a "sculptured" side-body treatment.
- **Acceptance tests for numerically controlled milling machines,** both profile and contour, to be delivered under the Air Force's Machine Tool Modernization Program, are being held this month at Giddings & Lewis, Fond du Lac, Wis. (a high-speed magnetic-tape machine with actuation equipment and interpolators built by Bendix) and at Kearney & Trecker, Milwaukee (one high-speed and one low-speed plastic tape machine.)
- **Look for air-conditioning to become standard on 1959 autos.** Only holdup now is the engineering and building of assembly equipment for the units.
- **First course on industrial abrasives to be given by an accredited college** will start September 27 at New York University. Consisting of 10 two-hour, one-night-a-week sessions, the course is open to anyone in the field. Fee: $25. Course will cover specialty grinding, carbide machining, grinding techniques.
- **Here's what absenteeism costs industry and workers every year:** 13% of employees' annual income ($800 million in lost wages and personal medical expenses), and $2 billion in production time. And prolonged illness hits 39 employees out of every 1000 each year, a five-year study shows.
- **First equipment contract let under Navy BuShips "value engineering" program** is to Solar Aircraft for a value analysis of the 50-hp Mars gas turbine. Under the program, a creative study is made of every cost item that goes into the product. Idea is to see that everything wears out at about the same time—like the "Wonderful One Hoss Shay"—and that costly non-essential items are eliminated.
- **Ultrasonic test equipment that spots thickness changes as small as 0.05%** in metals or plastics can be teamed up with automatic detection and recording devices to ring an alarm, flash a signal or activate compensating controls.

Spot index to major News stories...

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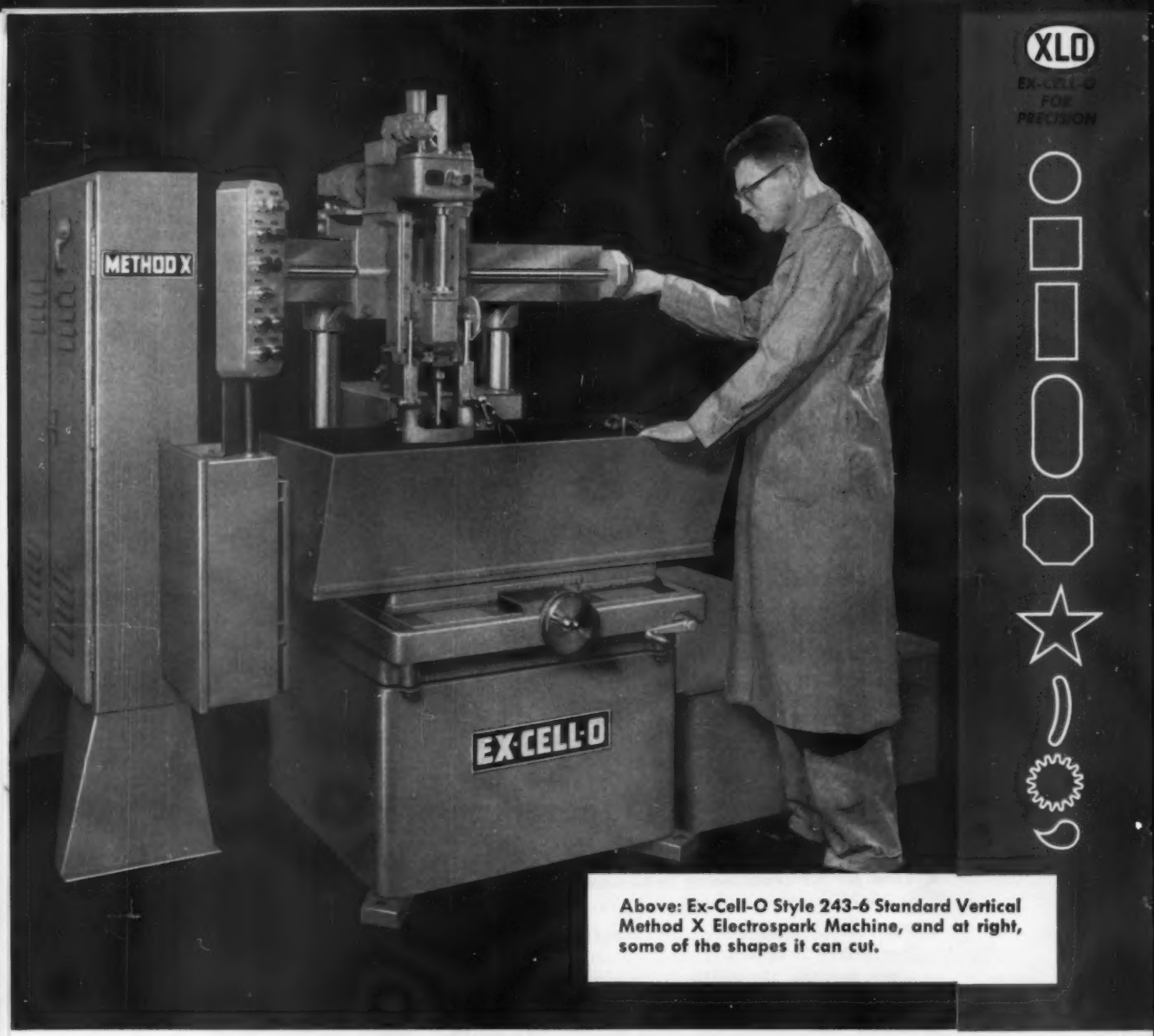

Above: Ex-Cell-O Style 243-6 Standard Vertical Method X Electrospark Machine, and at right, some of the shapes it can cut.

NEW! Electrospark Machine FOR TOUGH METALS

Sintered carbides and super alloys—in growing demand these days—are costly to machine, and even more costly to scrap. But you can now machine metals of extreme hardness and toughness easily and economically.

With an Ex-Cell-O Method X Machine, cemented carbides, hardened steels, cast alloys and titanium alloys can be cut off, pierced, slotted, formed, trepanned, drilled and tapped, often in shapes no other machining method can match.

Check on the very real savings Method X may offer to your operations . . . contact Ex-Cell-O in Detroit.

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AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-38

Washington ... NEWS REPORT

Pentagon reshuffle . . .

Defense Dept policy relating to industry is not expected to change materially because of the raft of top-echelon job switches now taking place. The most important shifts have seen Air Force Secretary Donald A Quarles replace Reuben Robertson, Jr, as Deputy Secretary of Defense: Air Force Undersecretary James H Douglas take over Quarles' former slot, and General Nathan F Twining, Air Force Chief of Staff, named to replace Admiral Arthur W Radford as chairman of the JCS.

It's assumed, however, that the Quarles-Twining elevation means an added stress on airpower in the formulation of strategic planning and a new push to turn Air Force theories on industrial mobilization into overall Pentagon policy.

Missiles for Britain . . .

The Eisenhower-MacMillan conference in Bermuda reaffirms plans for the US to supply Britain with guided missiles "in the interest of mutual defense and mutual economy." But firm decisions on types of missiles to be sent, the quantities and costs, delivery dates, and the like, have still to be set.

Reason for the indecision: the missile the British want most—the IRBM, which will carry a megaton thermonuclear warhead as far as 1500 miles in about 10 minutes—is still being developed. Authoritative estimates are that the IRBM won't be operational for 3 to 10 years.

Actually, it makes a lot of sense to ship the first IRBM's to Britain. We have few if any bases of our own from which Russian targets would be within IRBM range. In effect, British IRBM installations—whether manned by British or U S personnel—would provide forward offensive bases for us.

Importance of the Bermuda talks is that the British will now be made privy to detailed IRBM progress. Meantime, Britain will start getting large quantities of Douglas' Honest John and Firestone's Corporal—battlefield missiles in production for several years.

Presumably, there's no need for Congress to vote new funds at present to pay for missiles to Britain. Last year's military foreign aid appropriation contained a $500-million sum earmarked for supply of missiles and other new weapons to U S allies; it hasn't been committed yet. This year's appropriation request contains a similar fund.

Engineering waste in military?

The Pentagon has ordered a study of engineering waste in military research and development. Assistant Defense Secretary Frank D Newbury feels there's "extravagant" use of engineering manpower in projects, has set up a technical committee to probe the extent of the waste and to recommend changes in Defense Dept R&D.

As part of the study, a list of all technical proposals submitted to the military over the past two years—prior to award of firm R&D contracts—will be compiled, then total engineering effort involved in the proposals will be computed. In addition, cases will be compiled in which different companies handled design and initial production phases of development projects to measure duplication of engineering time.

Behind this study is the belief of Newbury's staff engineering experts that the practice of seeking detailed technical proposals from a large number of firms before awarding R&D contracts wastes considerable engineering effort. They think development contractors can probably be selected just as effectively through "management surveys."

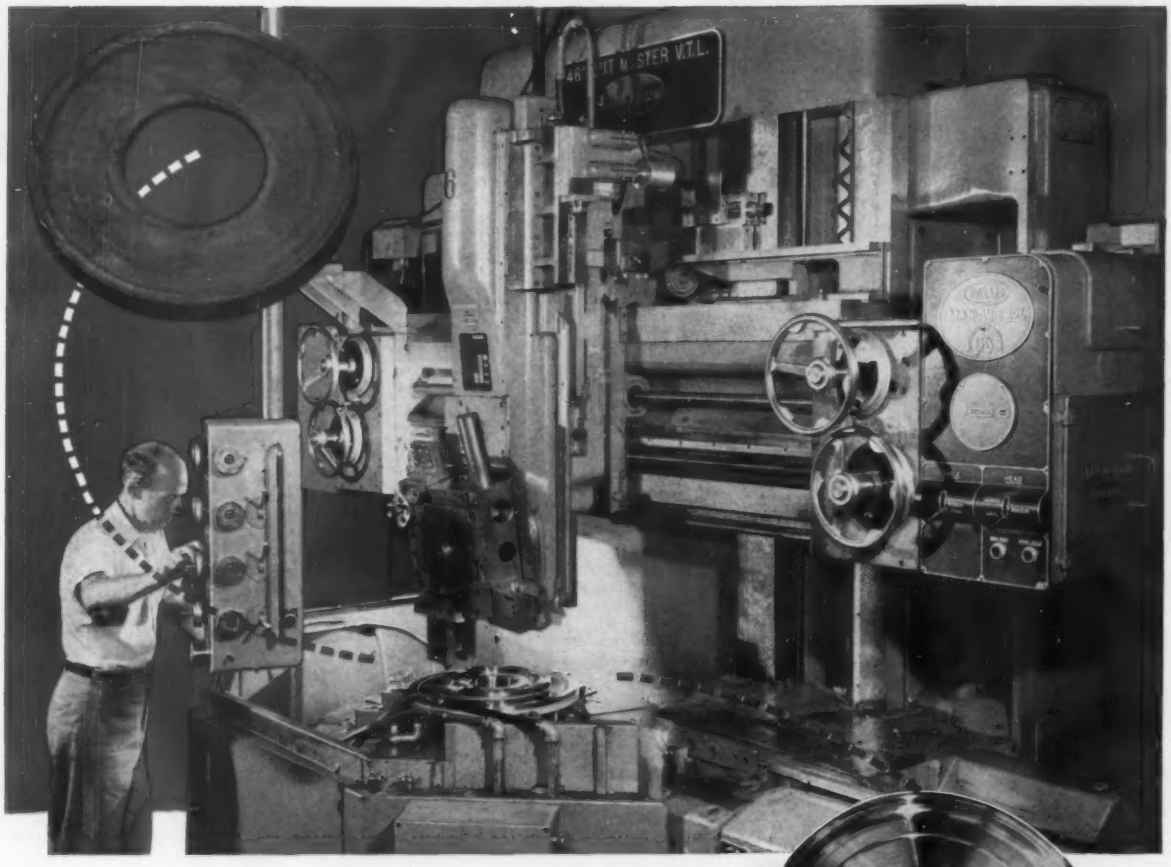
They also believe there's considerable wasted effort in allowing several companies to take over varied phases of development. Their argument is this: initial production of a complex new item should be kept in the shop that handles original development until all the bugs are out.

Plane and labor probes . . .

House Armed Services Subcommittee, headed by Rep F Edward Hebert (D, La) has started an investigation of the 17 producers of military aircraft engines. Objective is to find whether the producers' profits are "excessive" and to determine whether military procurement policy changes might cut these. Last year, the same committee investigated airframe producers, found no "excessive" profit by the industry.

Congressional labor racketeering investigators will center on the Teamsters Union for a long time to come. No metalworking unions are on the Senate Investigating Committee carpet at this time; most of the racket charges center either on the Teamsters or the building trades.

What happens to the Teamsters, however, will affect most other unions since their members come in contact with the trucking union. There's a chance of a flare-up if the teamsters should finally be expelled from the parent AFL-CIO. It would mean an end to some of the union peace pacts; a revival of jurisdictional battles.



"To produce quality parts in quantity . . .

Nothing beats Man·Au·Trol"

This statement by Mr. W. Mason Williams, Manufacturing Manager of the Jet Division, Thompson Products Inc., Cleveland, Ohio, is based on ten years of experience with Man-Au-Trol.

"If it hadn't been for Man-Au-Trol" Mr. Williams continues, "we would still be turning out aircraft engine components on manually-operated machines. Man-Au-Trol, particularly when tooled with better cutting tools, has enabled us to turn out at least *five times as many compressor disc and turbine discs per shift* as we produced on hand-operated equipment."

BULLARD

You, too, can apply to your machining problems the many advantages offered by Man-Au-Trol, Model 75 — just call your nearest Bullard Sales Office, Distributor or write for catalog to

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

Detroit ... NEWS REPORT

The spring that didn't surge . . .

Those purveyors of the notion that this year there would be no spring auto-selling spree are now giving out with the "I told you so" routine.

Production schedules have been cut back sharply. Now April-through-June schedules are slanted at a production figure 11% below that for the January-March period—instead of the 4.6% cut originally planned by the automakers.

Second-quarter production is now set at 1.6-million units—still a very healthy 10%-plus above second quarter 1956.

The breakdown on cuts: about 9.7% for Ford from the first quarter; about 15.2% for GM; about 3.5% for Chrysler; and around 6.8% for the rest.

Word is that Chrysler now plans to produce the 1957 Plymouth well into September (1956 model production stopped in August).

Chrysler is bothered by a strike in the Los Angeles assembly operation—called because UAW Local 230 resents production speedups. Plymouth will end all overtime by April 1. Dodge and DeSoto production are up, and Chrysler models are selling so well the Division plans to go on a six-day week for the rest of the model run.

Ford is still hitting six-day production in three of its plants, and Mercury output is at a very high rate. But Lincoln has fallen off almost 20%, undoubtedly because of inroads being made by the fast-selling Chrysler Imperial.

Over at General Motors, Chevrolet production has started to rise, Cadillac continues to run along steadily, but Buick, Pontiac and Oldsmobile production is sagging slightly.

At American Motors, Hudson and Nash output has dipped below the 200 mark total for both cars, while Rambler continues its 2100-a-week pace.

Studebaker hit a new production high for the year in mid-March, aimed at 6000 units for the month, but March 1956 saw better than 7300 units produced. Packard production is climbing steadily but slowly above the 300-unit-a-week mark.

All Detroit is talking about . . .

. . . the labor saga of James R Hoffa vs the Senate Investigating Committee; and the as-yet-not-all-told tale of an adept financier vs inept American Motors.

Detroiters think the ouster of both Beck and Hoffa from any labor activity is only a matter of time. If this happens, who will keep the powerful Teamsters from flying apart?

Mentioned often as the man who will gather up the loose reins is Harold Gibbons, onetime director of CIO's Retail, Wholesale and Department Store Employees' Union—a 4000-member local that broke off from CIO in 1948, and was taken into the Teamsters fold in 1949 by Gibbons. Now secretary-treasurer of the Central Conference of Teamsters, and top man among St Louis Teamsters, Gibbons is credited with more than enough personal drive to get to the top.

But Gibbons is not widely admired in the labor movement. A brilliant, cold intellectual (something the Teamsters as a whole are not too familiar with), he has originated and carried out many of the recent public relations moves designed to make Hoffa acceptable to the public.

And Gibbons has the unique role of being a "typical Reuther man" in a union militantly opposed to the UAW chief. As such, and as one high in favor with Jimmy Hoffa, Gibbons is much feared by the Teamsters' rank and file.

At dinner in a quiet Detroit restaurant, one such Teamster told us "The Teamsters' labor movement finds itself in a 'igmonius' position. We got troubles which ain't fair to us. And this guy Gibbons . . . I don't know about him . . . I think maybe Jimmy Hoffa has built hisself a Frankelstine."

A intellectual Frankelstine, though.

The other side of AMC's news . . .

When American Motors president George Romney faced the television cameras in Detroit's Sheraton-Cadillac to answer questions by the nation's press, it was what he didn't say, rather than what he said, that made news.

Mr Romney's mission was to acquaint the press about his talks with Miami financier Louis E Wolfson, who is AMC's largest single stockholder and who may very well control AMC by virtue of his and his associates' shareholdings.

Mr Romney didn't have very much to say—this was what he deliberately left unsaid:

Item One: AMC tooling is being cut to the bone.
Item Two: All AMC output will be rigidly scaled to dealer demand—and that demand isn't much for AMC's "senior cars"—Nash and Hudson.
Item Three: While Wolfson has turned down a seat on AMC's board, there's little doubt that he will exercise an enormous amount of control, which will make itself felt in rigid economies.

Announcing....

THE WORLD'S FINEST ELECTRIC CLUTCH

One of the best things that designers and users of electric clutches can know about Fawick Magnetic Clutches and Brakes is that they will outperform and outlast existing electric clutches—at no extra cost!

These precision units will establish new clutch performance standards because they are faster in action, more advanced in design, and more adaptable to a wide range of installations.

They are available in sizes ranging from 2 inches to 13 inches in diameter with torque ratings from 22 in-lbs. to 30,000 in-lbs. For detailed information, write the Home Office, Cleveland, Ohio for Bulletin M-101 or contact your nearest Fawick representative.

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INDUSTRIAL CLUTCHES AND BRAKES

Machine tools ... NEWS REPORT

New rental rates proposed . . .

Pentagon has frozen its machine tool leasing rates until a government interagency committee has completed a study of rental fees.

Office of Defense Mobilization, which heads the committee, has asked the Pentagon to continue at current rates on a month-to-month basis the facilities contracts now coming up for renewal.

The interagency committee favors a base monthly rental rate of 1¼% of the acquisition cost for the first four years of new equipment. After that, the rate would drop to 1% for the next four years, then to ¾% the succeeding four years, and hence to ½%, which would apply to all equipment more than 13 years old.

The government also would make an "availability charge" of ¼% for machines less than four years old and a similar charge for equipment over 13 years of age. Purpose of the latter would be to prevent contractors from renting for only ½% tools actually 13 years or older, but never used.

Rates claimed to be in line . . .

Committee spokesmen claim that the proposed rates, to which the Defense Dept representative is opposed, would be pretty much in line, on a long-term basis, with average rents charged in 18 commercial tool leasing plans.

Right now, armed services get a rental of 1% per month, but a very large percentage of machines are leased by contractors without fee, the rental charge being offset in the price of the product being sold to the services.

Rental rates were increased about two years ago to a sliding scale of 2%, 1½% and 1%, depending upon the age of the equipment. But virtually no machines are out on lease at these rates.

Pentagon favors renewal at these rates of facilities contracts first signed during the Korean period and now expiring.

Congress gets rate complaints . . .

Contractors wishing to continue to use government-owned machines are complaining to Congress and to ODM about the increased rates.

One small contractor, for instance, claims that the new rates would boost his leasing costs 86%. He now rents 36 machine tools at 1%, his contract ending in June.

ODM officials contend that their proposal "would restore equity between contractors leasing government tools and those leasing their own." They say that the government now collects only $24 million annually on tool rentals. If all contractors paid rent, $182 million a year would flow into the U S Treasury.

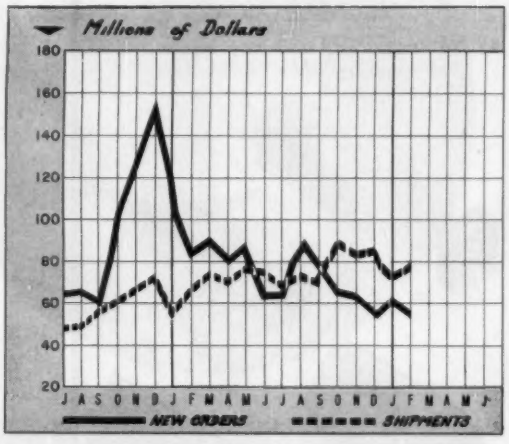
Another merger completed . . .

Avey Drilling Machine Co, Cincinnati, has been merged with the Motch & Merryweather Machinery Co, Cleveland, and hereafter will be operated as the Avey Division of Motch & Merryweather. Avey will retain its present facilities, management and personnel. Motch & Merryweather's Cleveland plants will provide substantial increased facilities for Avey's assembly and heavy machining operations.

Avey will celebrate its fiftieth anniversary May 1. Motch & Merryweather, largest U S machine tool distributor, has been a distributor for Avey for nearly 50 years.

Pacific Industries Inc, San Jose, Calif, has announced it will buy Hufford Machinery Corp, El Segundo, Calif, builder of stretch form presses and other machinery. Hufford will be the seventh company acquired by Pacific Industries since early in 1956 and the third in the metalworking field.

Dumore Co, Racine, Wis, has bought the manufacturing and sales rights for a line of portable precision machining units known as Versa-Mil. To be known as the Dumore Versa-Mil, the machine is an attachment for lathes and other machine tools and is primarily used for milling.



MACHINE TOOL SHIPMENTS ROSE SLIGHTLY, while net new orders dropped slightly in February. New orders were down to $58.1 million from January's revised figure of $63.2 million, while February shipments rose to $78.1 million from January's $76.5 million on the NMTBA Index

VASCOLOY-RAMET PRESENTS . . .

VR-

NEW VR-75 quality carbide is a vacuum sintered steel-cutting grade developed specifically for use where high heat is generated. On such work, it will out-perform any grade of carbide available today

AVAILABLE NOW

In throw-away and long inserts for negative rake toolholders

VR-75 is an addition to the standard line of V-R quality steel-cutting carbides which meet 80% to 90% of all steel machining requirements. On applications where severe heat and shock conditions are a problem, new VR-75 is the thoroughly field-proven answer. It is ideally suited to heavy turning, facing, boring and milling jobs where coolants are not used . . . and will also give excellent results on a great many general steel machining operations.

VR-75 gains its exceptional heat resistance, high edge strength and high shock resistance from the special blending of tungsten carbide, titanium carbide, tantalum carbide, columbium carbide and cobalt. Maximum performance is assured by its grain structure and exceptional purity. Vascoloy-Ramet's exacting quality control procedures assure a constant, superior, uniform product.

In the history of the carbide industry, there has never been a higher quality product than new VR-75 steel cutting grade.

For complete information, call your local V-R representative or distributor, or write.

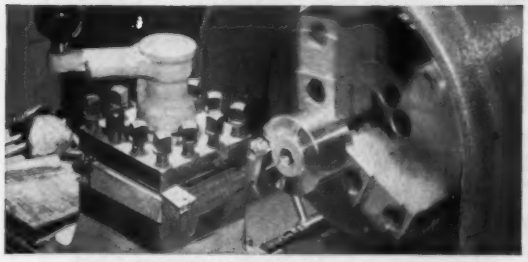
SEND FOR NEW BULLETIN . . .
Get complete facts about this cost-cutting carbide today.

VR-75

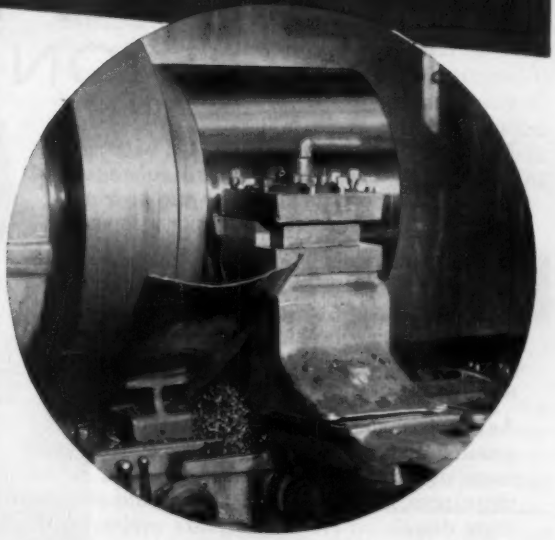
A SUPER STEEL-CUTTING CARBIDE GRADE

NEW VR-75 HAS

- High heat resistance
- High shock resistance
- High edge strength



VR-75 Has Set Performance Records on Jobs from 1" to 36" Diameter



New VR-75 will increase production . . . minimize downtime . . . and drastically reduce tool costs on rough jobs like these:

- Wheel turning
- Roll turning
- High speed milling
- Crankshaft cheeking

. . . and many others.

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FACTS

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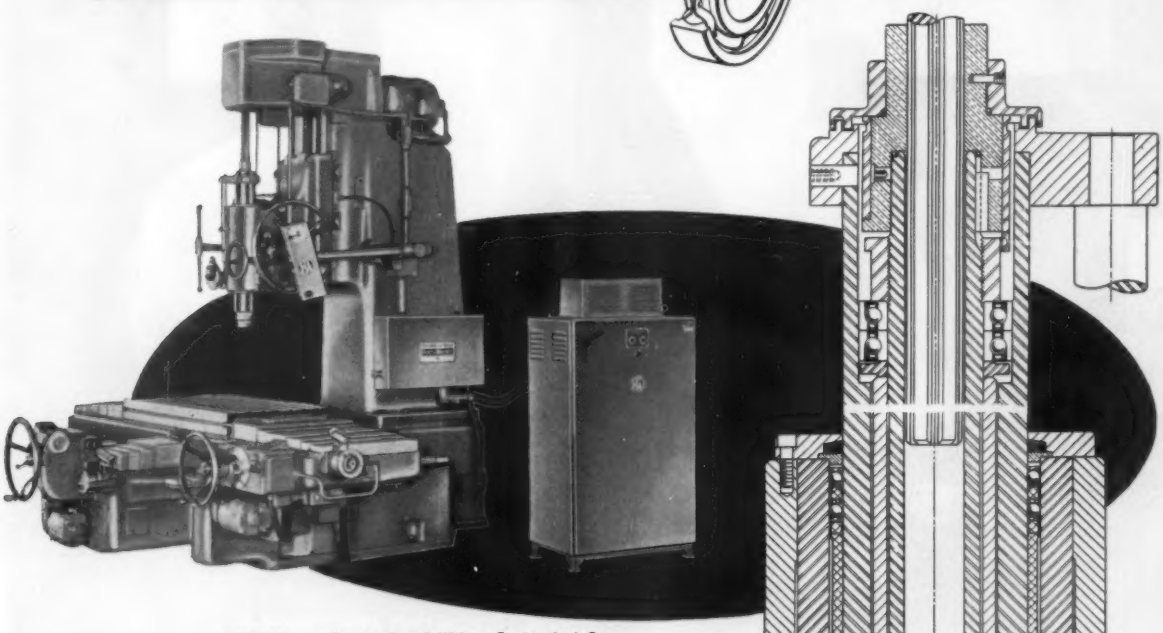
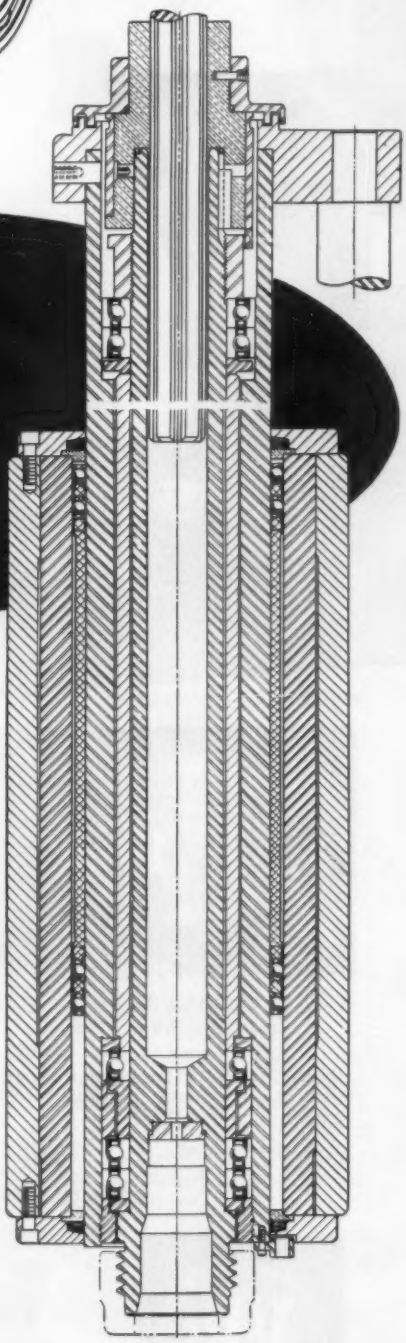
NEW DEPARTURE BALL BEARINGS



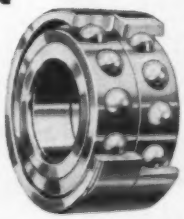
5' 3E Jig Borer—Courtesy Pratt & Whitney Co., Hartford, Conn.



INVESTMENT IN PRECISION

No finely built machine entrusted with cutting metal to extremely small tolerances can be any more precise than the bearings on which its major rotating parts depend.

That's why you'll find this exquisitely accurate Jig Borer Spindle is mounted on New Departure preloaded duplex *ball* bearings. These bearings assure *permanent precision* through a wide range of speeds and feeds.



New Departure Duplex ball bearings are available in a complete range of sizes and series and are made to the finest precision tolerances.

As a further accuracy feature, the hardened, ground and lapped spindle quill moves on a large number of preloaded steel balls, thereby eliminating any clearances, however small, that would otherwise be required. For more details on New Departure preloaded duplex ball bearings, send for Catalog S.

SEE "WIDE WIDE WORLD" SUNDAYS—NBC-TV

BALL BEARINGS MAKE GOOD PRODUCTS BETTER

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

What's ahead ... in Metalworking

NEWS REPORT

'57 may set a peacetime record . . .

Production of military aircraft, missiles and other national defense items will have an important part in keeping metalworking operations close to a peacetime peak throughout this year.

First quarter performance has been so good for Metalworking as a whole, in fact, that 1957 is likely to set a new peacetime record, based on manhours worked.

There may be a slight drop in the second quarter. But should it occur, it won't amount to much. Metalworking production will be going along pretty evenly on a high plateau. And it may well stay there in the final half as well as in the first half.

Aircraft represents bigger slice . . .

Aircraft and guided missiles already constitute a much bigger slice of metalworking operations than they used to. They would gain further importance except that defense authorities are finding it hard to decide exactly what they want. Current production programs, in some cases, are being stretched out longer than anticipated and others are being phased out without immediate replacements. But this situation is viewed as temporary.

Automobile assemblies still are less than many in the industry had expected. Moreover, Detroit is digging into its own inventories for steel to such an extent that it will have reduced its steel stocks by an estimated 1 million tons by mid-year or sooner.

Outlook for farm implement production is better than it has been for some time. The same is true of farm tractors. Two factors are responsible for the improvement: better feeling among farmers as a result of higher prices and of better moisture in certain areas; and favorable acceptance of new models recently put on the market.

Materials handling demand rises . . .

Sales of materials handling equipment are up from the 1956 level, which established a new record. Current prediction is that the year's dollar volume will show a 5% gain.

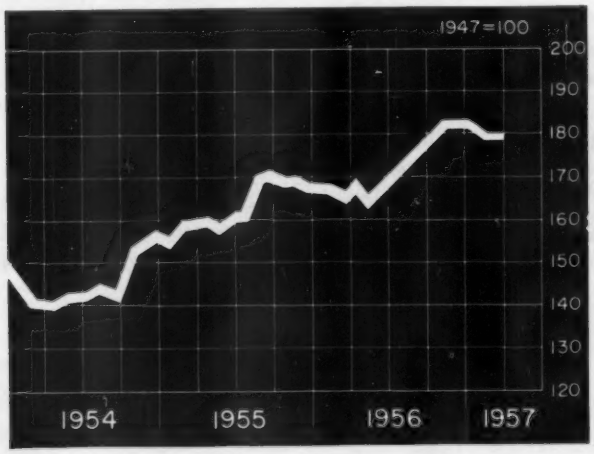
Construction equipment has lagged considerably behind last year's activities. But a pickup is due soon. The big impetus to be derived from the federal government's gigantic highway program probably won't be felt until 1958.

While orders for industrial furnaces are not what they were, dollar volume of sales of induction and dielectric heating equipment is ahead of last year's.

Electrical machinery doing very well

Heavy electrical machinery, such as steam turbines and generators, is in such demand that plant facilities are booked well into 1958.

Shipping industry has a rash of new orders. Both east and west coast yards are full of work. Repair orders now are strictly subordinate to new construction, both in private and government yards. Sales of most domestic appliances are softer at retail than a year ago. Dealers, however, are maintaining their stocks well and look for an improvement this spring.



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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAR. Esti-mated	FEB. Pre-liminary	JAN. Re-vised	FEB. Year Ago
Total Index	**179**	**180**	**180**	**168**
Machinery	**157**	**156**	**148**	
Electrical Machinery	**201**	**207**	**192**	
Autos	**140**	**146**	**139**	
Other Transportation ...	**368**	**352**	**310**	
Other Metalworking	**144**	**143**	**139**	

NEWS REPORT

What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAR. Estimated	FEB. Preliminary	JAN. Revised	FEB. Year Ago
Total Index	**152.0**	**151.4**	**151.1**	**141.9**
Metalworking Machinery	**174.6**	**174.5**	**161.5**	
Other Machinery exc. Electrical	**159.9**	**159.7**	**148.3**	
Electrical Machinery	**153.1**	**152.0**	**137.6**	
Fabricated Metal Products	**143.3**	**143.1**	**136.5**	

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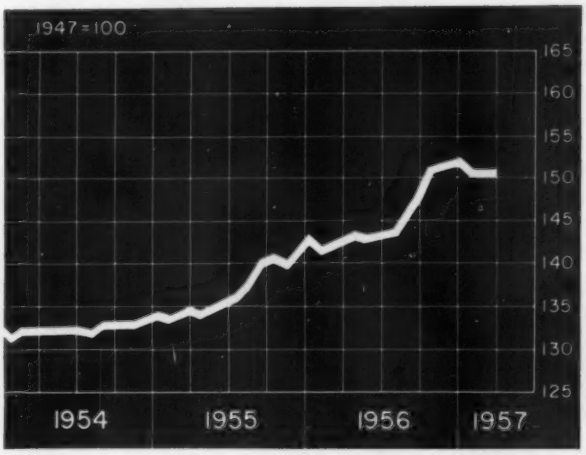


Business should stay good through '57 . . .

General business promises to stay at about the present high level during the entire year.

Gross National Product, often cited as the best barometer of business as a whole, is estimated at $30 billion for 1957. This will represent an increase of about $20 billion over 1956, a good part of which stems from higher prices.

Gross National Product is likely to average higher the last half of the year than the first half. An upswing in Gross National Product during the fourth quarter of 1956 gave impetus to the upward movement that is carrying over through 1957.

Consumer spending is almost sure to show a gain for the year. In fact, there is a good chance that it will go up quarter by quarter as a result of higher incomes.

Keep in mind that a hike in government spending will make itself felt in the second half, as the 1958 federal budget takes effect. More than that, state and local government outlays are scheduled to rise each succeeding quarter.

First important spending on the national highway construction program will get under way in the July-December period.

Purchases of non-durable goods, and services, are expected to stay as high this year as 1956.

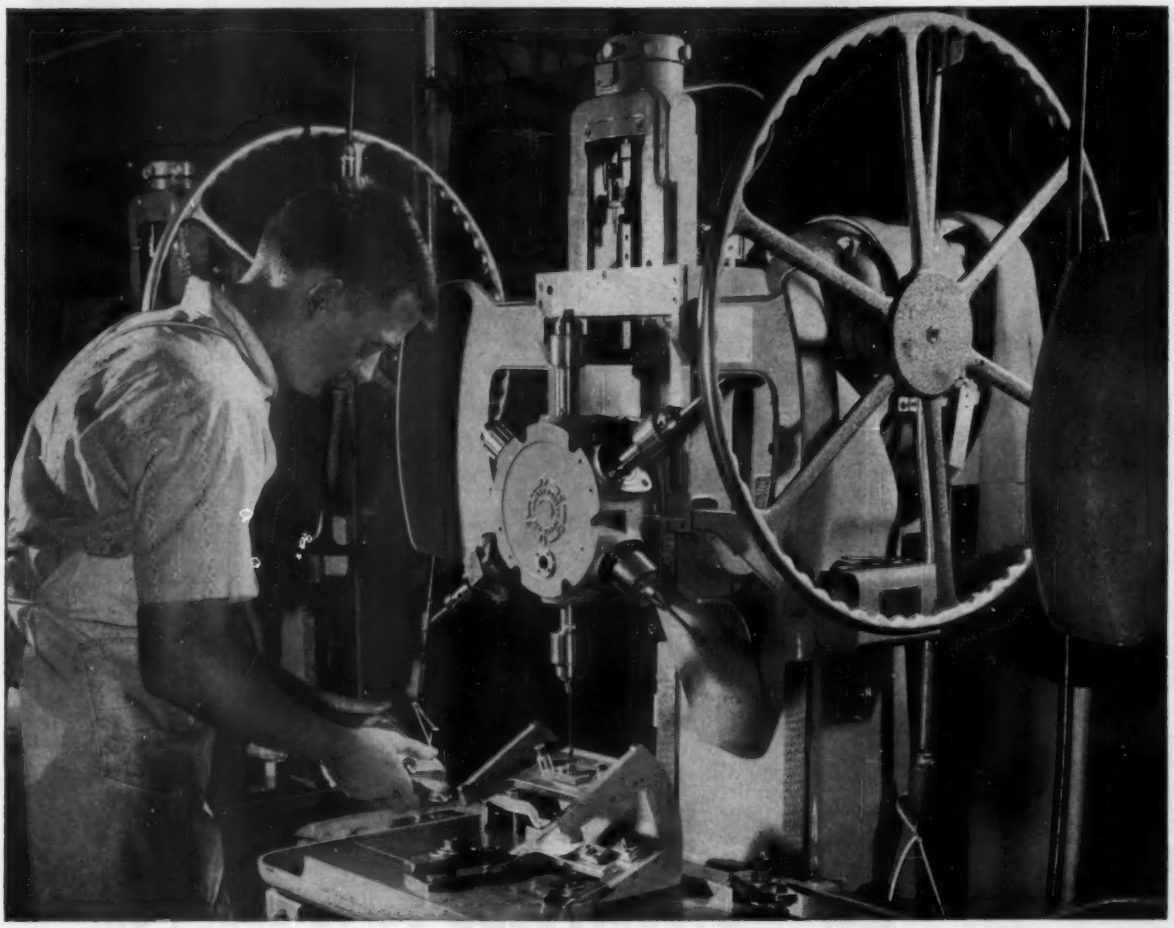
Federal Reserve Industrial Production Index may well stay on its present high plateau all year. It may drift off a little, in the current quarter, but not enough to worry about.

A drop in accumulation of inventories is one of the healthy developments this year. The automobile industry in particular is working off sizable stocks of materials the first half. A number of industries are engaged in reducing their stocks of finished products by adjusting their production accordingly.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	148.0	148.1	148.9
Steel ingot production (thousands of tons)	2,354	2,392	2,452
Electric power output (million Kilowatt hours)	11,723	11,650	11,202
Production of automobiles and trucks	173,875	172,477	167,519
Engineering construction awards (Eng. News-Record—millions)	$ 359.0	$ 375.9	$ 459.5

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	247	200	313
Vacuum cleaners sales (thousands of units)	281	300	243
Washers sales (thousands of units)	298	358	357
Household electric ranges sales (thousands of units)	114	79	118
Radio production (thousands of units)	1,715	1,382	1,786
Television production (thousands of units)	627	680	605
Gear sales index (1947-49=100)	235.7	216.2	245.5
Foundry equipment new orders index (shipments, 1947-49=100)	115.6	121.0	183.9

* Seasonally adjusted.



BURGMASTER® turret drills increase servo actuator production 25%

Here is what they say at Parker Aircraft Company, Los Angeles:

"Our bank of five 6-spindle Burgmaster turret drills have replaced a large number of single spindle machines and on this job performed thirty operations with a production increase of 25%. Drilling, tapping, counterboring and countersinking was accomplished with one set up. Lightweight fixtures could be used and, with fixture clamped in alignment under the spindle, a higher level of quality was maintained with improved finish. Repair work dropped to a minimum."

Automatic hydraulic Burgmaster (6-and 8-spindle models) feature skip indexing, automatic cycling and infinitely variable pre-selective feeds. All models (including the 6-spindle manuals and radial) provide power indexing, pre-selective spindle speeds and very close pre-selective depth control.

For complete information, write Dept. AM-4

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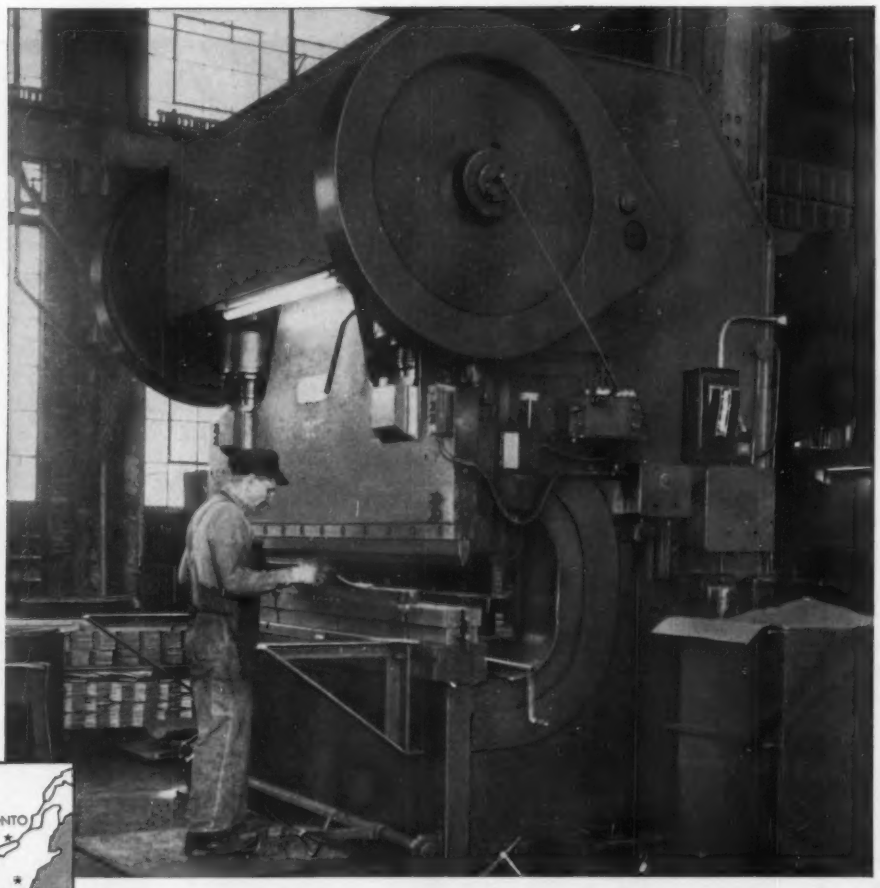

Installed in the Chicago plant in 1948, this 260 ton capacity machine, Model J4½-6, forms the smaller and lighter gauge conveyor panels. Illustrated is a curved section being formed of ⅜" plate to a radius of 8".

STEELWELDS Serve Link-Belt Plants *From Coast-To-Coast*

NINE LINK-BELT Company plants located from California to Pennsylvania, Texas to Ontario, Canada, and in Transvaal, South Africa, have one to six Steelweld Presses and Shears. Nearly every year since 1944 more Steelwelds have been purchased. Slightly over half of the machines are shears.

As a large manufacturer of a wide variety of conveying and processing equipment such as apron, screw, oscillating and overhead chain trolley conveyors, railroad car dumpers, bucket elevators and other handling equipment, Link-Belt plants must shear and form a great amount of steel plate. From experience, Link-Belt has learned that Steelwelds are outstanding for this work.

There are several reasons for this. For instance, the accessibility of controls and ease of making adjustments. The all-around solid construction that permits continuous operation with hairline accuracy. The heavy, well designed machinery which requires minimum maintenance.

Like Link-Belt, when you really get to know Steelweld Bending Presses, you, too, will be elated with their performance.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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STEELWELD

PRESS BRAKES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Revolution on Your Doorstep

Nowhere else are new techniques of metalworking production likely to be developed so fast as in the aircraft industry.

Sheer necessity is at the back of it. You cannot incorporate into the design of your product growing amounts of high-strength steel and titanium alloys, and whole new families of non-metallic materials such as glass, fused quartz and ceramics, and high-temperature plastics, without doing a lot of production pioneering.

"The next several years will see a real breakthrough in the design of aircraft," one airframe maker states. "It cannot help but have a tremendous effect on manufacturing personnel, facilities, equipment, techniques and tooling."

Just to get down to . . .

what's ahead, some fighter airframes will be 40% to 80% steel and titanium within the next three years. Bonded, brazed and welded structures will be increasingly used. These materials will contain a great deal of sandwich construction.

Increased emphasis on fatigue resistance and on weight reduction will affect the configuration of many parts. Parts up to 75 ft in length will be fabricated, processed and transported.

Every ounce of excess weight will have to be removed from planes, even if it should mean complex forming of thin-gage metals or vastly increased machining.

The new processes, the application of old processes to new materials, and the need for increased precision throughout will result in a higher level of technical ability in all phases of airframe, engine, and accessory manufacturing.

These developments will have devastating effects. In anticipation, aircraft companies already see the necessity for expanding sharply their manufacturing research programs. They are convinced that they must speed up the progressive replacement of their production equipment. One company, to be specific, regards its present equipment and many of its methods as outmoded. Tolerances cannot be held on currently used materials. Think what will happen when less workable materials for tomorrow's planes come into their own.

If you are not in the aircraft industry, you may say that all of this makes interesting reading but is of no real concern to you. Right there is where you are wrong.

Scarcely a metalworking business . .

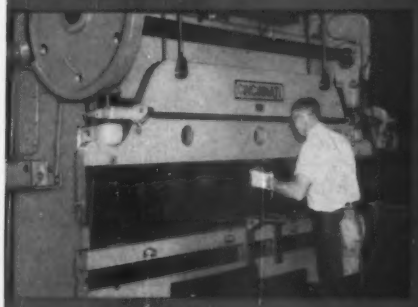
of any kind these days is not caught up in new designs of products, new materials and new manufacturing processes. It has no other choice.

Perhaps high cost of manufacture is the reason. Possibly price competition is at the bottom of it. Maybe new markets are responsible. Whatever it is, you cannot afford to stand still for long or you will be lost.

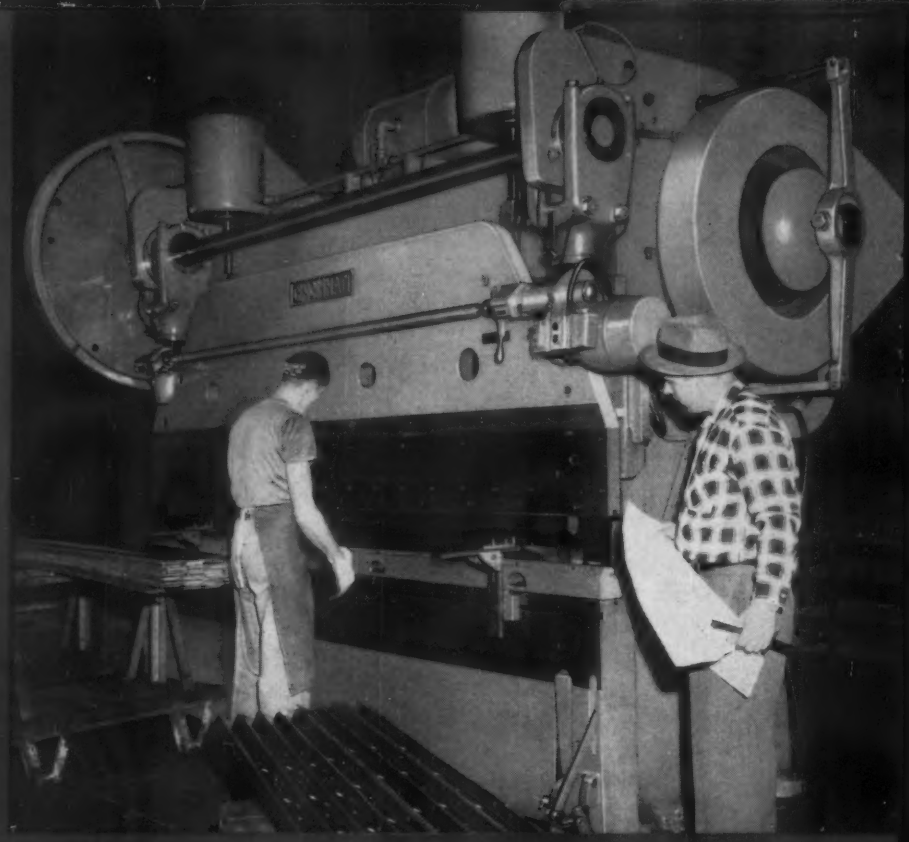
So you should follow closely what is going on out on the West Coast and in other aircraft producing areas. A revolution in metalworking production techniques is taking place right in front of you. It is a good bet that you will learn a lot from it that will help you in solving your own problems.

Burnham Finney EDITOR

A setup for punching is shown being made on this 10', 335 ton capacity Cincinnati Press Brake.



Tool boxes for New Holland Balers are shown being formed on this 8', 90 ton Cincinnati Press Brake.



This 10' Cincinnati Press Brake has a capacity of 150 tons, and is shown forming frame angles from ½" steel.

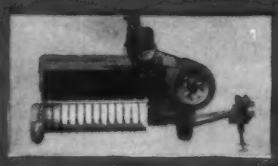
Punching and forming on accurate Cincinnati Press Brakes

. . . at NEW HOLLAND MACHINE CO., New Holland, Pa.

Three Cincinnati Press Brakes are profitable producers in this finely equipped plant. Some of the standard features which contribute to the accuracy of these versatile machines are:

- All-steel interlocked construction (no welds used as load supports).
- Rigid, deep beds and rams insure accurate, uniform performance.
- Centerline loading eliminates weaving of frame and cramping of slides and guides.
- Tilting ram adjustment is useful for fadeout work—micrometer indicators make it easy to reset ram parallel to bed.
- Automatic pressure lubrication system insures proper oiling.

Write Department A for Catalog B-4R, and consult our Application Engineering Department about your production problems.



This Hayliner 68 Baler is just one of the many fine New Holland products made with the aid of Cincinnati Press Brakes.

Photos courtesy of New Holland Machine Co., New Holland, Pa.

CINCINNATI

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American Machinist

Don't overlook the human element in inspection

Human beings won't give way entirely to mechanical inspection marvels. But it is disconcerting to find that both skilled men and trained inspectors give rather poor performance. How do you find the good ones—how do you keep them up to snuff? Here are some pointers from industrial psychologists

DONALD C KING and ERNEST J McCORMICK, Occupational Research Center, PURDUE UNIVERSITY

When shop employees, including toolmakers, can't measure within tolerance, there is something wrong. You have got to figure that:

1. They were not properly selected and trained in the first place, or
2. They have forgotten how to measure and should be retrained.

Because it is a safe bet that people will continue to play an important part in inspection, despite the vogue for mechanization, we must recognize that they have human deficiencies. In turn, these deficiencies may and do affect the adequacy of inspection.

LIMITATIONS OF HUMAN BEINGS

The deficiencies of human beings in inspection operations have been demonstrated experimentally. In a plant manufacturing variable-pitch propellers Lawshe and Tiffin[8] analyzed the accuracy of approximately 100 inspectors. A test room consisting of 20 booths was set up. In each booth was one of 20 precision instruments, a standard part and a simplified drawing that indicated one dimension to be measured with the instrument provided. Each employee was tested only on those instruments which he used on his job. The number of men tested in each booth ranged from 117 to 162. Each man made five measurements of the dimension in question and recorded his best judgment of the "true" measurement of the dimension. ("True" measurements were determined by ultra-precision instruments in combination with gage blocks.)

The percentage of employees whose estimates of the dimension fell within the prescribed tolerance limits ranged from 9% for using an inside caliper and a 6-in. micrometer (± 0.002 in.) to 66% for using an inside micrometer (± 0.001 in.). See Fig 1.

In another plant a somewhat similar survey was carried out with 45 toolmakers. Each man measured each of 19 parts 5 times, with a standard vernier micrometer, and then recorded his best judgment of the "true" measurement.

The results, shown in Fig 2, indicate the percentages of inspectors who measured different numbers of the 19 parts accurately to within ± 0.0001 in. No toolmaker measured more than 12 parts to the prescribed tolerance.

Although we see that human error can occur in inspection operations, the situation need not be

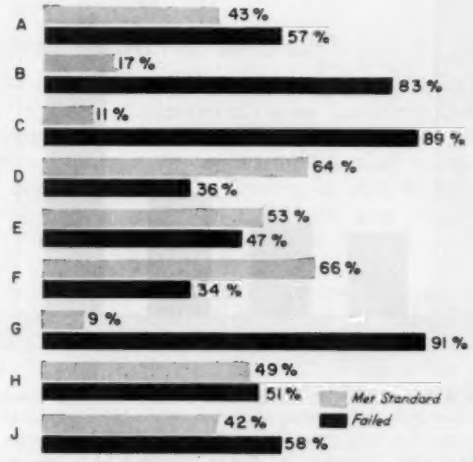

FIG 1.. How inspectors fared on measuring tests in an aircraft propeller plant (From Lawshe and Tiffin):

Test	Task	Persons Tested
A	1-in. vernier micrometer, ±0.0001	172
B	2-in. vernier micrometer, ±0.0001	138
C	6-in. vernier micrometer, ±0.0001	131
D	3-in. regular micrometer, ±0.0001	146
E	Depth micrometer, ±0.001	142
F	Inside micrometer, ±0.001	117
G	Inside micrometer and 6-in. micrometer, ±0.002 in.	112
H	Outside caliper and 6-in. rule, ±1/64	117
J	Inside vernier caliper, ±0.001 in.	113

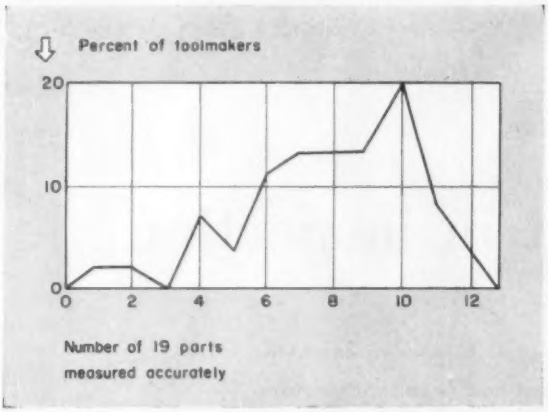

FIG 2.. Toolmakers measured 19 parts with a standard vernier micrometer. Not one was able to get beyond 12 parts measured to within ±0.0001 in. of true dimensions

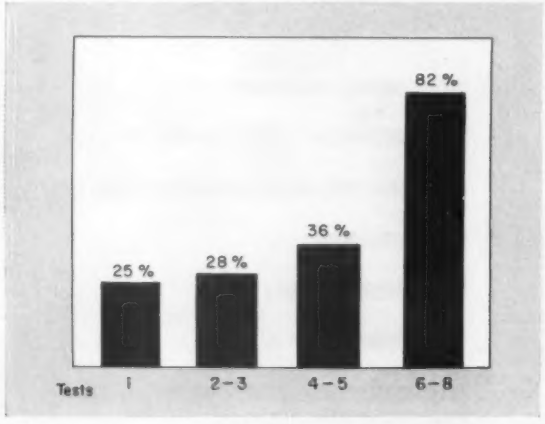

FIG 3.. Your chances of getting an above-average inspector improve with the number of visual tests administered. If you give one test to a group, it is likely that 1 in 4 who pass will make a good inspector, but if you require 6 to 8 tests it is a 4:1 bet that successful applicants will prove out in practice (From Stump)

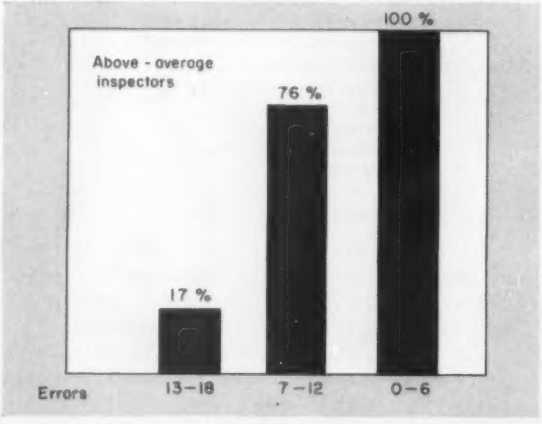

FIG 4.. When a perception test was administered to electrical inspectors, Cook found that of those making 13-18 errors, only 17% could be classified as "above-average" material, whereas none of the below-average applicants made as few as 0-6 errors

discouraging. There are at least three ways of increasing effectiveness of inspection activities: (1) through selection of new inspectors with the greatest potential, (2) through proper training of inspectors, and (3) through development of inspection methods that make for optimum human performance.

TO GET BETTER INSPECTORS

What kinds of people are most likely to be successful inspectors? To decide this, we must first identify characteristics that differentiate above-average inspectors from below-average inspectors. This analysis requires two types of information:

1. Information about job performance (sometimes called a criterion of job performance). Examples are: ratings by supervisors, customers' complaints, performance on a "job sample" test, errors identified through re-inspection, and job tenure. On the basis of such information about individual inspectors, they can then be divided into above-average and below-average groups.

2. Information about personal characteristics (scores on various kinds of tests, plus biographical and other information from the application form, etc.).

The examples described below illustrate instances in which this type of analysis has resulted in improved selection of new inspectors.

VISUAL TESTS

In one study Kephart[6] administered the Ortho-Rater vision tests to 99 lens inspectors in an optical manufacturing company. Vision test scores of the inspectors were compared with the percentage of employees who had stayed on the job for 8 mo or more. It was found that 43% of the inspectors who passed the vision tests had stayed on the job, while only 4% (one man) of those who failed the tests had remained on the job.

In another investigation, Stump[10] worked with inspectors whose jobs required close visual attention. He used three different standards of job performance (quality of work, quantity of work, and supervisor's ratings) and then compared these job performance measures with scores on the Ortho-Rater vision tests. The results are illustrated in Fig 3.

PSYCHOLOGICAL TESTS

Cook[3] used a perception test in a study of electrical-circuit inspectors. Fig. 4 shows a comparison of the scores on this test with the ratings of inspectors in terms of whether they were above or below average in efficiency.

JOB SAMPLE TESTS

Whether or not a job sample test is feasible for inspector-selection purposes depends largely on the extent to which it is possible to separate a "part" of the job that can be administered to inexperienced applicants in a reasonably short period.

BIOGRAPHICAL AND PHYSICAL INFORMATION

In some instances certain kinds of biographical or physical information have been related to job per-

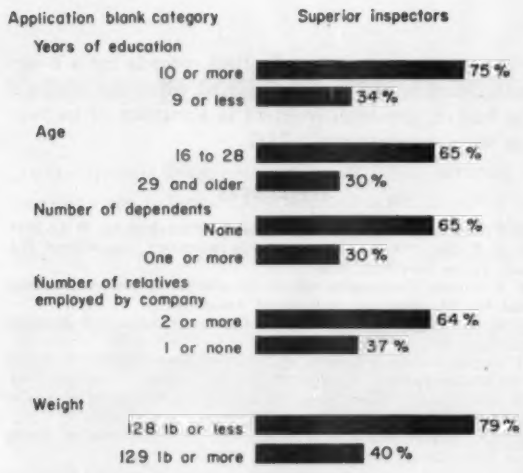

FIG 5.. Personal data often supply clues to superior inspectors. For the particular job, 75% of the best inspectors had 10 yr or more eduction, 65% were between 16 and 28 and had no dependents, and 79% weighed 128 lb or less (From Coe)

formance. For example, Tiffin and Rogers[12] found that female tinplate inspectors who were at least 5′2″ tall and who weighed at least 118 lb were better inspectors on the average than inspectors not meeting these physical requirements.

In another study, Coe[2] analyzed 11 items from the application blanks of 65 bottle inspectors. He compared this information with the inspectors' scores on job-performance test. Five application blank items significantly differentiated between superior and other inspectors. The findings of this study are summarized in Fig 5.

INSPECTOR TRAINING

Although several investigators have found that experience alone does not necessarily improve inspection performance, well planned and executed industrial training programs can result in significant improvement in the work performance of inspectors, as found by Evans.[4] He studied errors in vernier micrometer measurements made by journeyman toolmakers and machinists. It was found that the average amount of the errors made was considerably larger than assumed by most authorities. During the same study a 7-hr training program was set up for students with no experience. They were first taught to read a micrometer. Then they practiced measuring gage blocks, checking their accuracy after each measurement. The effects of this training upon their performance, and a comparison between their performance and the average error of toolmakers and apprentices, are shown in Fig 6. Evans concluded that ". . . a small amount of directed training can accomplish more than years of blind repetition." The fact that errors increased noticeably after a 10-day period without practice suggests that the performance of new inspectors needs to be evaluated continuously.

INSPECTOR TRAINERS

The studies by Tiffin and Rogers[12] and Evans[4] demonstrated that the use of more experienced inspectors as trainers often does not result in adequate instruction for new inspectors. The experienced men may merely have taught their own bad habits to the new inspectors.

If the training of new inspectors is to be done by an experienced inspector, he should be carefully selected in terms of *training* ability as well as inspection ability.

TYPE OF TRAINING

Tiffin[11] stresses the fact that in learning an inspection job efficiently, a new inspector cannot merely be told to throw out defective material. He states that a new inspector must be given specific instructions concerning the nature of the defects he is to detect and must be specifically instructed about how to look for these defects.

The use of specifically designed job analyses, and of time and motion studies if economically practical, is probably the safest way of assuring specific, to-the-point training.

IMPROVING INSPECTION METHODS

Considerable attention has been given to the manner in which the material to be inspected is displayed for the inspector. An example is the rather widespread use of optical projection methods. Polidor[9] stated that the training of men in the use of the optical projection equipment was relatively easy, because the trainer and the learners see exactly the same thing.

Perhaps the seeing task should be reviewed. For inspecting tapered metal rollers, an eye camera was used to record eye movements and time of eye fixation of the inspectors. The rollers were fed and automatically turned for visual inspection by a machine[13]. On the basis of the eye camera films, the machine for presenting the rollers was modified to

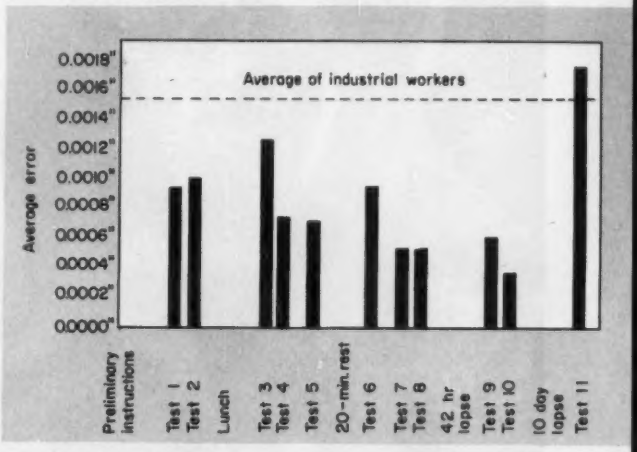

FIG 6.. Training increases the accuracy of measurement but any lapse induces retrogression. Periodic retraining or checking is necessary (From Evans)

Human element in inspection . . .

permit more central vision and longer eye-fixation time without increase in total cycle time.

In a laboratory study of inspection carried out by Kephart and Besnard[7] it was found that defects on clear-glass spheres could be more accurately identified if the spheres were rolling laterally rather than toward the inspector. This finding suggests that objects that are moving at a constant distance from the eye may be more accurately identified than those that are approaching the inspector.

USE OF EXAMPLES AS STANDARDS

Numerous psychological studies have demonstrated that people are better able to make relative judgments rather than absolute judgments. If an inspector is presented with an example of what is acceptable (or unacceptable), and compares other objects to this example, there is a strong likelihood that he will be able to make more adequate judgments of the items being inspected.

For example, Kelly[5] was concerned with the success of inspection of glass faceplates for television picture tubes. Prior to the study each inspector was "told" what kind of defects should be rejected (and perhaps was shown some examples of defects). To improve the selection process, each inspector was provided with a "limit sample" of each type of defect. On the basis of production records for a 6-mo period before and a 6-mo period after the method was begun, the improvement in accuracy of inspection was approximately 76%.

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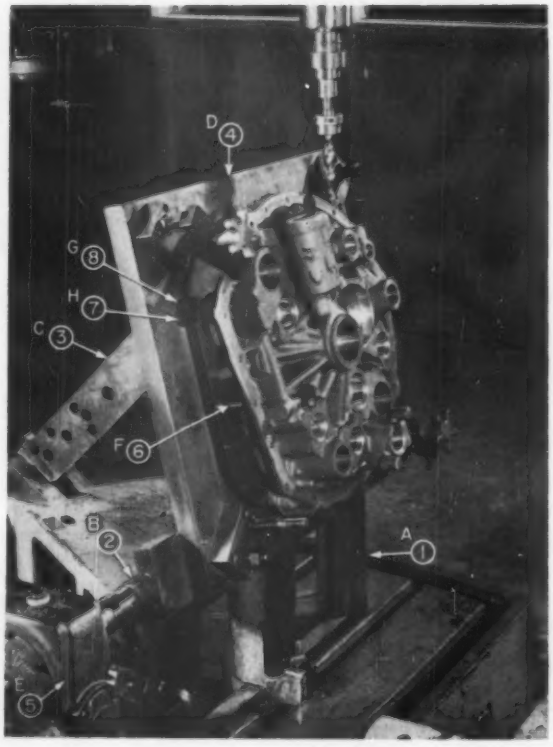
Sine-bar fixture to drill compound angles



NORMAN W COTE, assistant chief, process planning, LYCOMING DIV. AVCO MANUFACTURING CO. STRATFORD, CONN

With a modification of the sine-bar principle, one preproduction holding fixture with "slap-on" drill jigs produced 31 compound-angle oil holes. The part is the supercharger rear cover for R-1820 radial engines.

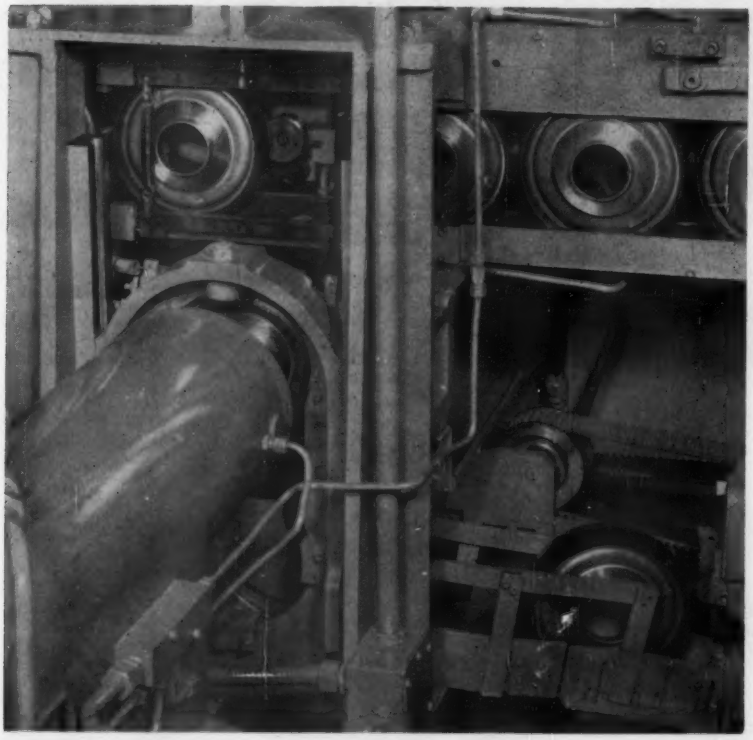
Base *A* has pivot point *B* and a "shot-pin" bar *C* secured at the back of the work-holding plate *D*. By removing the shot-pin (which goes through the ears on the base and the jig-bored bar), it is easy to crank the fixture to any of the alternate positions with the reductor unit *E*. This establishes the angle-of-inclination more accurately than a tilt table.

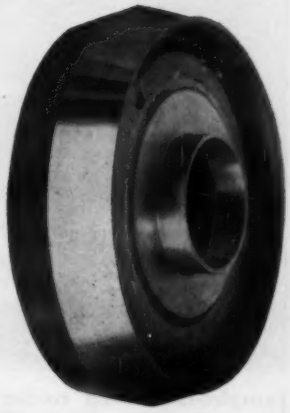
The part is located on a center-bore plug and a diamond-pin locator *F*, which can be moved to any of the pre-determined angle of rotation locations, such as *G* and *H*.

The number of combinations is limited only by not having locations of the diamond pin so close that they over-lap. Bushed holes on the shot-pin bar can be staggered to permit a large number of holes on a single bar. Angles exceeding 90° can also be produced on this set-up, prior to the development of permanent tooling.

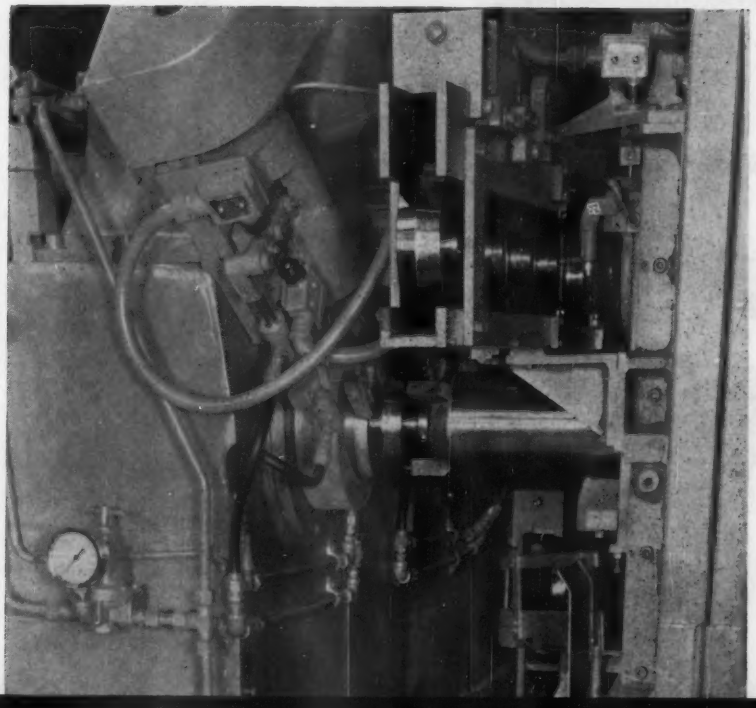
Special machines finish transmission gears automatically

At the Detroit Transmission Div of GMC, internal reverse gears for Hydramatic transmissions are automatically finished with specially developed Gisholt equipment, made up of four standard machines mounted on a common base. Automatic loading and unloading, as well as automatic cycling, cuts costs and provides high production rates

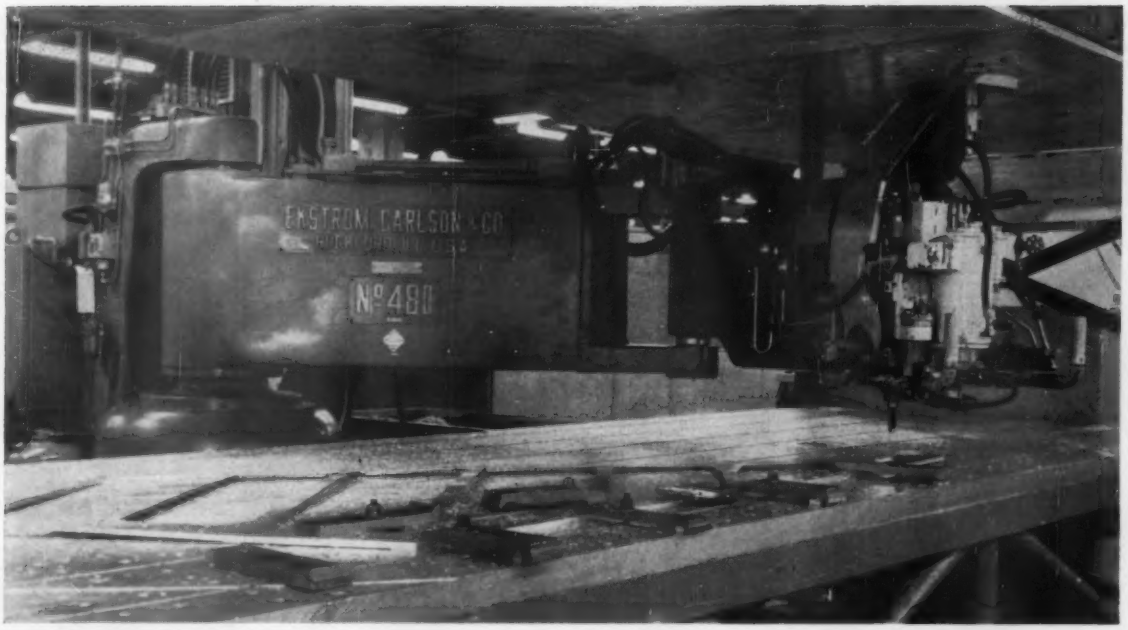




Superfinishing . . .
. . . of large internal transmission gears from 38-40 to 5 mu-in. rms is handled automatically in this 4-station setup. Gears about 6-in. dia and hardened to R_C 50 are loaded into upper conveyor for transfer to the heads. At each head a stripper removes a gear from the conveyor; gear is then positioned in a shuttle that carries it into alignment with an air-operated tailstock quill. Quill advances to carry gear into engagement with one of the four rotating spindles. Spindle speed is 350 rpm and stone pressure is 50-60 psi



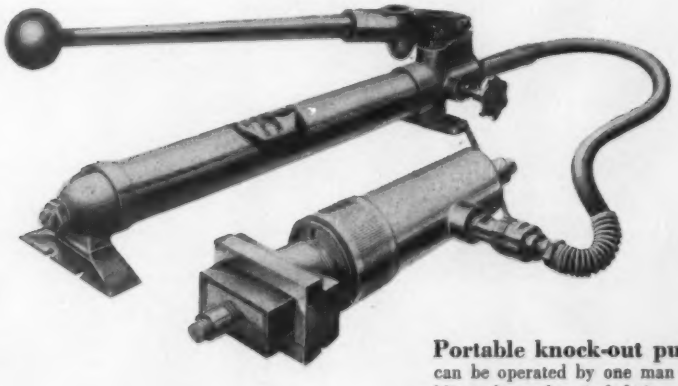
Special spindle-face adapter...
. . . of the Gisholt gear-finishing machine employs rawhide work drives. Superfinishing stones engage the gear from each side of the tapered OD. After completion of operation, tailstock quill retracts, moving the gear with it. As loading shuttle moves upward to receive a new part, finished gear is stripped off tailstock quill by shuttle movement and drops into a discharge conveyor, where it is gravity fed by endless belt to the next operation



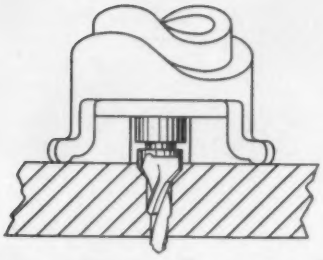
Templet-controlled router . . .
does precision milling on B-58 wing slugs. Special tooling added to machine allows it to pick up contour from templet overhead. Depth control is automatic; vertical travel is 8 in. max. Machine has hydraulic controls and coolant system; spins cutter at 7200 to 14,500 rpm, and will take up to ¾-in. cutter. This does work of larger, more expensive equipment

Tooling ideas from Convair

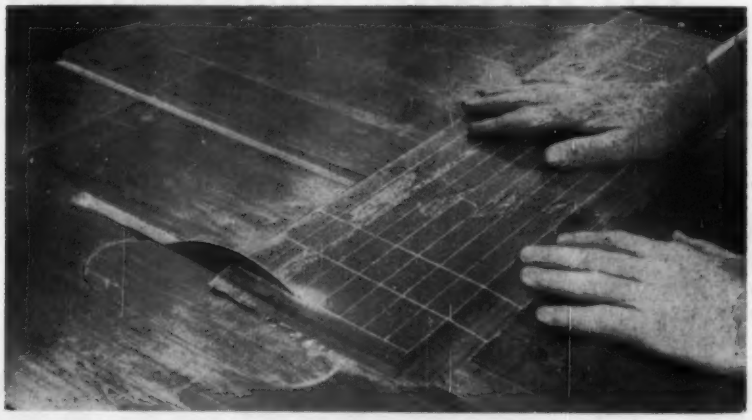
Any wide-awake shop has a number of special machine adaptations for its own use. Here are five from Convair Div of General Dynamics Corp at Fort Worth . . .



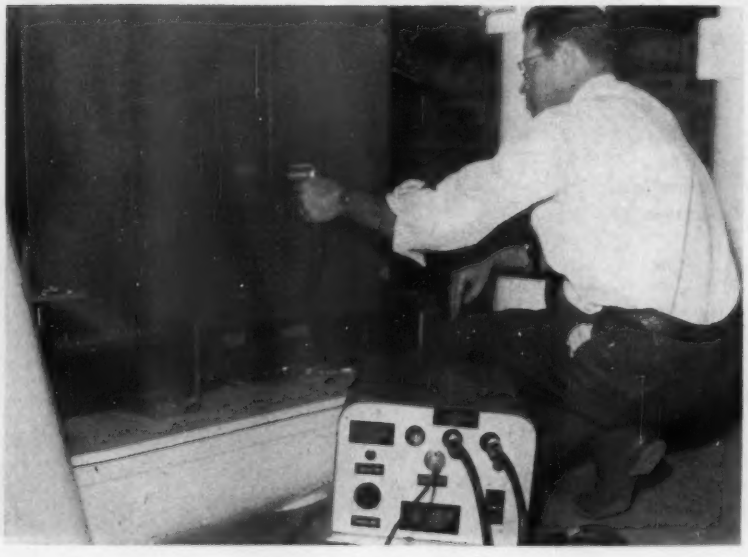
Portable knock-out punch . . .
can be operated by one man to knock out holes in B-58 assemblies where electrical fittings must go. This replaces expensive hand routing and filing. Unit is hydraulic, weighs only seven lb, and punches up to ⅛-in. aluminum alloy



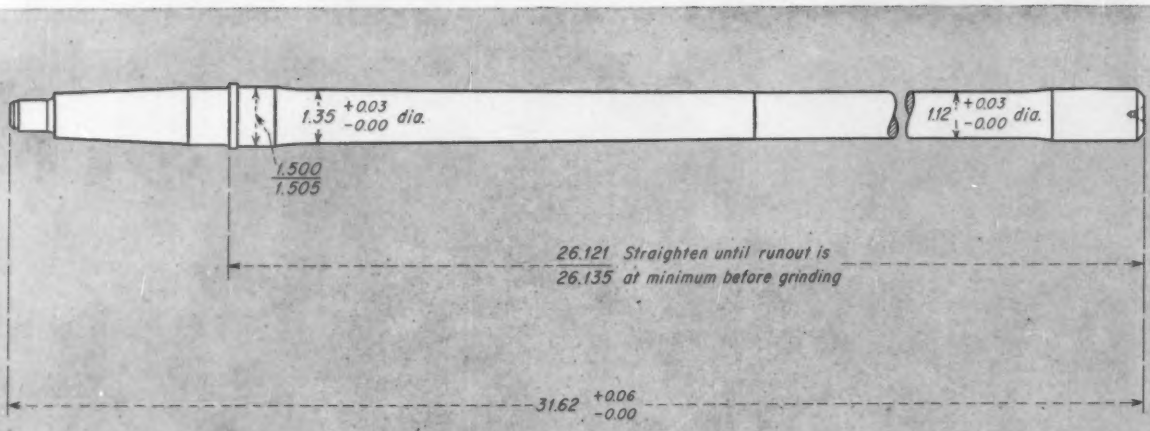
Step-drill guide . . .
contacts work face to align drill where depth control and angularity are critical. Three points adapt it for flat or curved surfaces. Unit will drill, countersink, or counterbore for rivets, bolts, or screws. Maximum length of tool with spindle telescoped full length into hole is 10⅜ in., so drill will work in close spaces. Spindle accuracy is to 0.003 in. tir



Diamond saw . . .
cuts glass-cloth parts without danger of delaminating. Tilting-arbor table saw has 10-in. diamond-impregnated blade for flat work; table router with smaller diamond blade cuts flanged work. Diamond saw lasts about 100 times as long as conventional blade, cuts faster, heats less, and makes cleaner, burrless cuts



Explosive rivets . . .
get into blind panels and spaces where ordinary rivets can't be set. Castored power unit has heat control and timer that fires rivets after ½ to 4 sec of preheat. Gun handles rivet diameters from ⅛ through 3/16 in., using interchangeable heads. Outfit works on 110 v



Induction hardening

..Improves quality..Reduces straightening..Increases production

Automatic induction heaters have replaced obsolete furnaces at Chrysler Corp's Axle & Transmission Div, Lynch Road, Detroit, where rear-axle drive shafts are produced. Production is up 35%, the process is simplified and less expensive, and a number of subsequent operations have been eliminated.

Previously, these SAE-1037 shafts were hardened in gas-fired furnaces, quenched, then drawn in more gas furnaces; eight in all. Expensive gas-generating equipment produced protective atmosphere for the process, and production rate was only about 140 shafts per hr in each pair of furnaces.

ONE HARDENING-DRAWING CYCLE

Now, two brand-new and one older induction unit do the work. Each of the new heaters has two six-station fixtures that allow loading one fixture while the other is working. The 31x1½-in. (maximum dia) shafts are completed at 350 per hr per machine.

Two Reliance Electric vertical generators provide 600 KW at 3000 cps to each new induction heat-

Hardening and drawing takes a minute . . . (actually, 63 sec) at Tocco induction heater. While this fixture is being unloaded and loaded, a second is in process, passing shafts through induction coils, quenching rings, and (on the return stroke) drawing coils. Pit under machine receives hot quench water, which is pumped at 1500 gpm to cooling tower outside building

er, while the older machine is served by a single generator. Power requirement is 100 KW per shaft.

Machined shafts are delivered to the induction heaters via conveyor and gravity chute. Each fixture on the machine has six rotating spindles that hold the shafts between centers as they are lowered through 7-turn induction coils. Feed rate is 0.8 in. per sec; shaft temperature is raised to 1700 F.

At the bottom of the down stroke, the shafts are quenched at high-velocity in water to produce a minimum surface hardness of 50 R_c and a minimum case depth of 0.160 in. Although the entire length of each shaft is treated, the keyway end is drawn back to 41-47 R_c for a length of 3¼ in. by energizing the coil briefly as this end passes through on the return stroke. The opposite, splined end retains 50 R_c. When the cycle is completed, power is cut off automatically and the second fixture on the machine is energized.

OVERHEAD TEMPERING

Hardened shafts are loaded into carriers on a monorail conveyor that carries them up to the gas-fired tempering furnace at the ceiling.

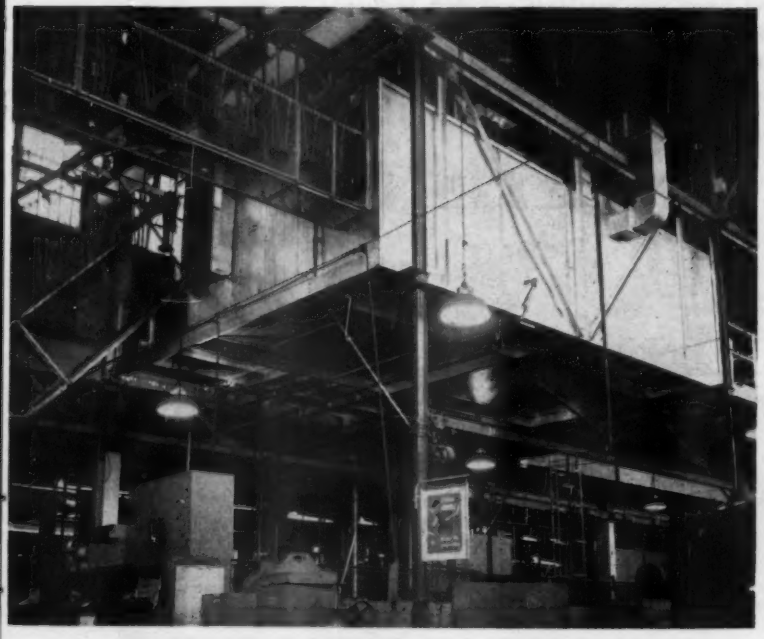
All shafts are next checked for straightness in a ten-fixture bank, where those that require attention are transferred to a straightening press.

Straight shafts are carried by belt conveyor to a Wheelabrator unit that removes hardening scale. This operation is considerably faster and simpler than the older grit-blasting method; in addition, shot-peening has been eliminated because of the uniformity of hardness resulting from induction heating.

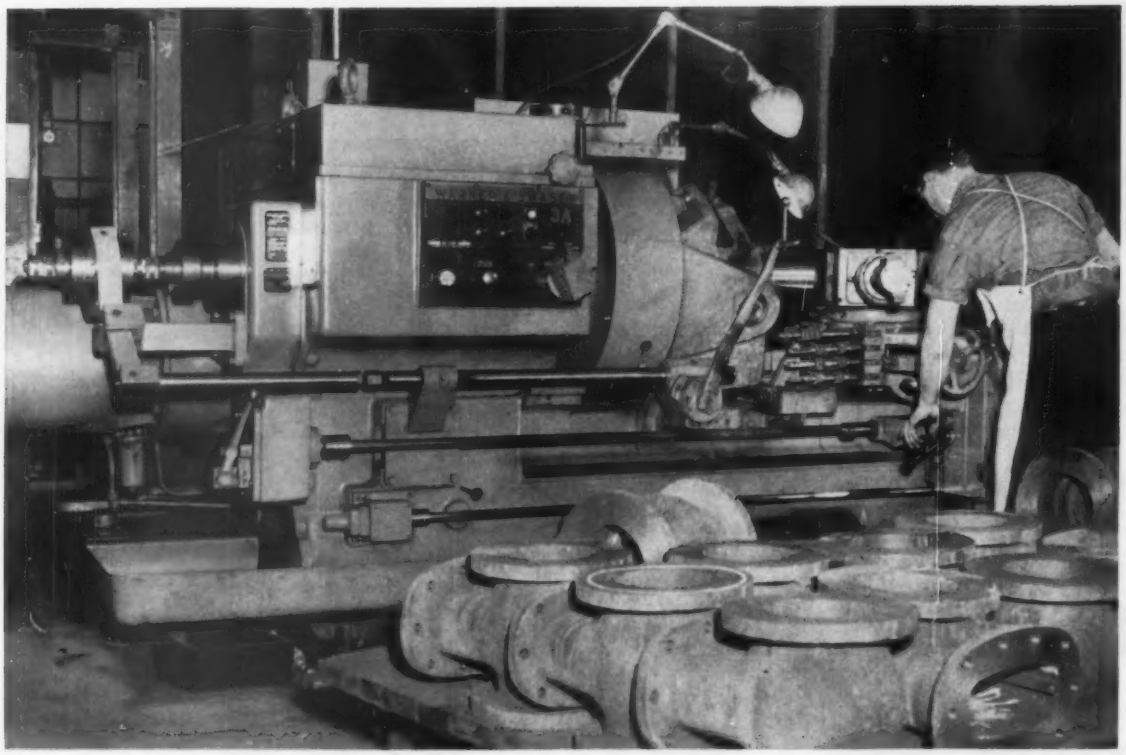
for long shafts . . .

GEORGE H DE GROAT, Detroit editor

Tempering at ceiling level . . . saves floor space. Stresses are relieved at 500 F. Monorail carries shafts up from heating line, and back down to straightening line



Straightening corrects shafts . . . to within 0.010 in. TIR at ends. Number handled at 20-ton Flexible press is much reduced from older process. Finally, shafts are belt-conveyed to grit blaster that removes scale

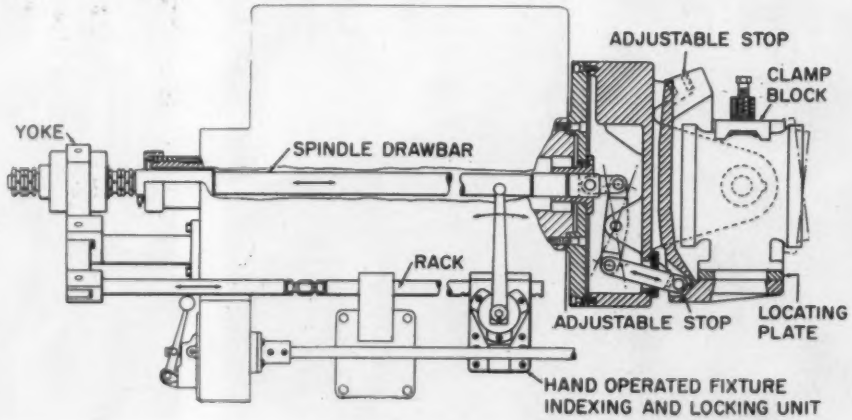


Valves in three sizes; 4-, 6-, and 8-in.; are machined internally on 3-A Warner & Swasey gap-bed turret lathe. Two similar lathes handle 2- through 6-in. and 6- through 14-in. sizes, because overlapping capacity makes production scheduling flexible. Valves may have hubbed, mechanical-joint, flanged, or "Ring-Tite" ends, and either parallel or solid-wedge seats

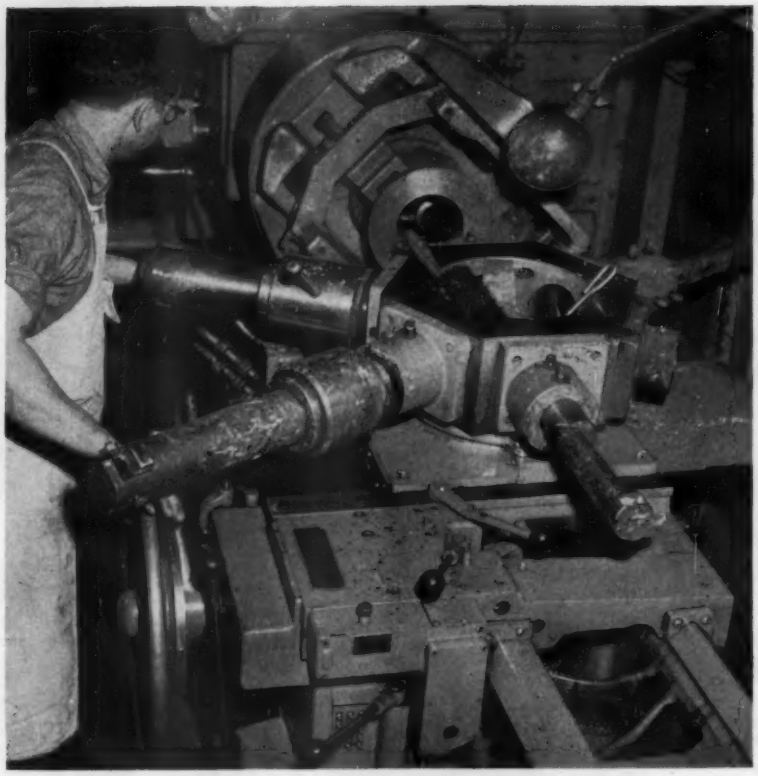
Turret tooling flexes valve machining

Cutting valve-manufacturing costs was the object when new machines and new tooling were installed during a modernizing program at Kennedy Valve. This new equipment both reduced costs and improved quality, raising production 20-30%, and reducing scrap to a fraction of 1%. Most important in the long run, it simplified operations and provided great flexibility

GEORGE K STEHLE, general superintendent, THE KENNEDY VALVE MFG CO, ELMIRA, N Y

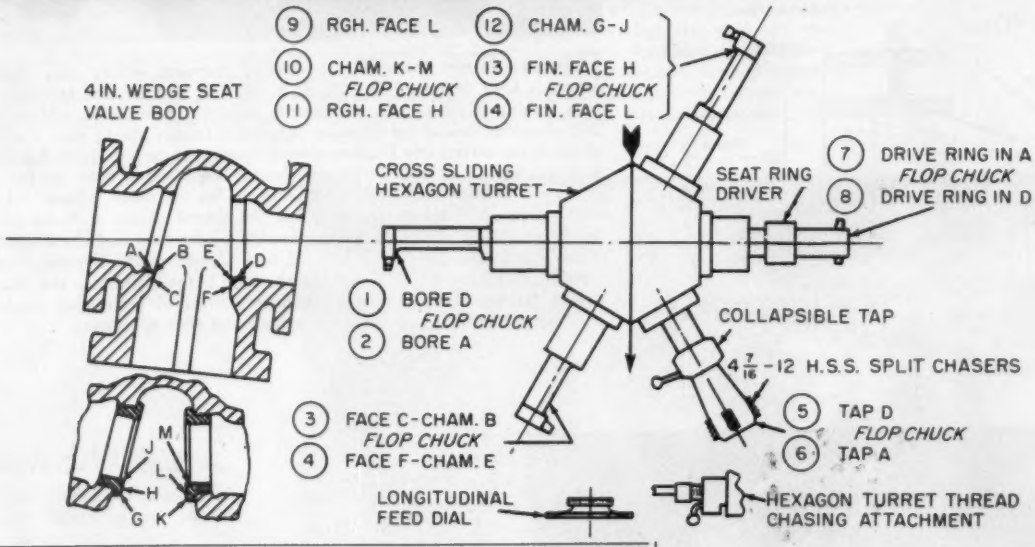


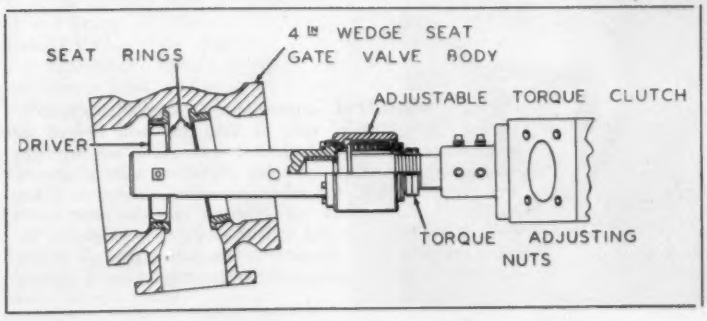
Fixture adapts for parallel or wedge seats when locating plate and clamping block are changed. Fixture also indexes 90° and 5° to each side of center while spindle is rotating so both parallel or wedge seats can be machined at a single chucking. Actuating linkage for this goes through headstock, and is controlled by lever at operator station



Lathe was furnished with gap bed so it would swing large fixture. Special turret faces, bores, threads, inserts bronze seat rings, and faces rings. Machine also has longitudinal feed dial and swing stops on saddle apron to allow quick setup of dual stop positions

Tooling can be quickly changed to another valve size. No time is lost in backing out a tap because Landis split-chaser tap can cut both seats in a valve when spindle rotation and feed direction are reversed. Compact tooling is possible because body flanges on valves are cut separately by three-way facers

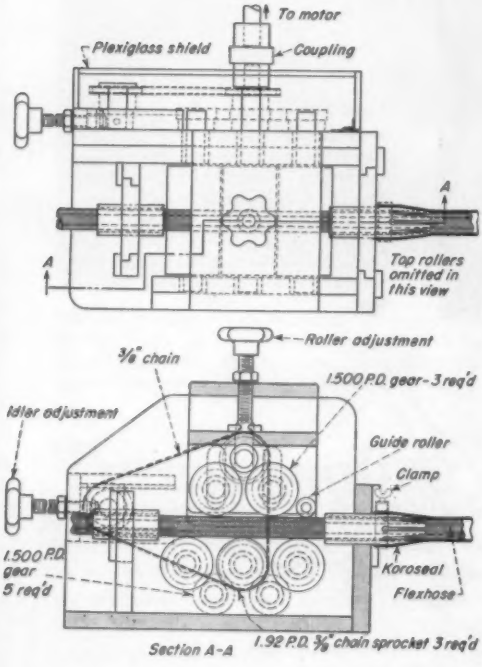


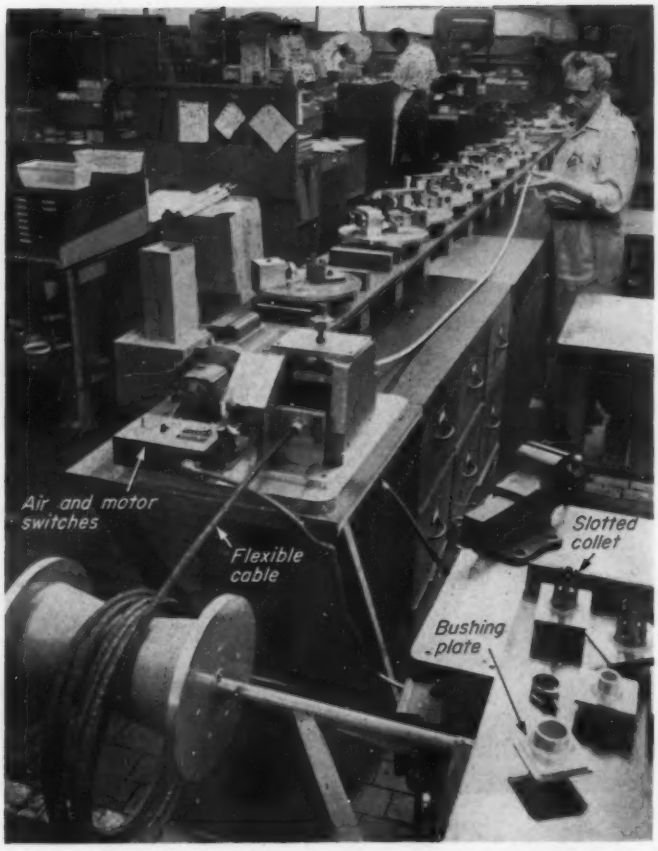


Ring-seating tool has adjustable torque clutch that applies right amount of force for each ring size, releasing automatically when ring is to depth. No lathe headstock alterations were required. Both seat rings of wedge valve are driven without removing tool because valve body is flopped while spindle runs at full speed

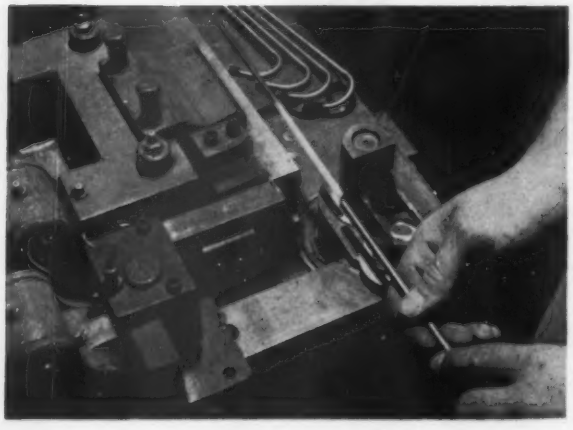
SHOP SHOTS

AT GRUMMAN... Part 1

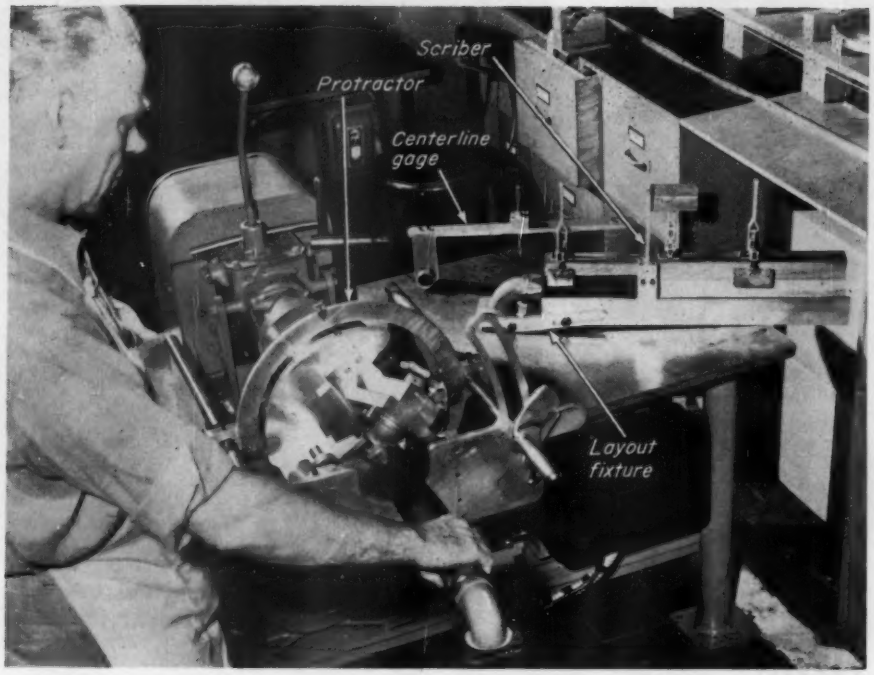




Floor-to-floor time for assembling Koroseal tubing over flexible hose has been decreased by 60% as a result of an ingenious assembly fixture. Tubing is placed over the hose to protect it from acids, oils, rotting, and abrasions caused by vibration. Operator fastens tubing over a slotted chuck of the correct size (various sizes of chucks can be seen in background) and then seats it in front of fixture where it is allowed to float. At the rear of fixture another floating-bushing plate guides the cable between adjustable rubber feed rollers to the ID of the slotted chuck. A ¼-hp geared motor supplies power to the rollers through a gear train and chain sprocket drive. Air at low pressure is injected into the end of the Koroseal tubing, causing it to expand. At this point, the hose is easily fed into the inflated tubing for any desired length. Previous method of performing assembly was entirely manual and obviously tedious and time consuming



Nylon mandrel permits bending small-diameter tubes (¼-in. dia x 0.016-in. wall, ⅛ hard SS) well beyond the tangent point of the bend wheel, and devoid of any flattening or bumping. In effect, the nylon provides a solid plug mandrel that bends with the tube, in the same manner as a ball mandrel, but keeps the tube-diameter over the bend radius well within tolerance and free from any imperfections. Because the tube inside diameter is relatively small, use of ball-mandrels is almost impossible for bending tubes ¼ in. and less in diameter



Alignment fixture accurately positions flange fittings automatically to any desired angular relationship and torque setting. Flexible hose assemblies are now processed to a high degree of accuracy in a matter of minutes; formerly took hours manually on a trial and error basis. To insure proper angular alignment between hose and first fitting, operator places sub-assembly into layout fixture, securing flange face flush with baseplate. Hose is then clamped and a sliding scriber transfers assembly centerline, for reference only, onto the hose. Operator then slips sliding centerline gage onto two arbors that position gages to centerline of machine's spindle. Hose sub-assembly is mounted into machine—its scribed centerline aligned to pointer on gage—and then clamped by chuck. Angular relationship between the two fittings is set on protractor. Second flange fitting held in spindle chuck is screwed onto the hose until the machine comes to an abrupt halt when torque setting and angular relationship are reached

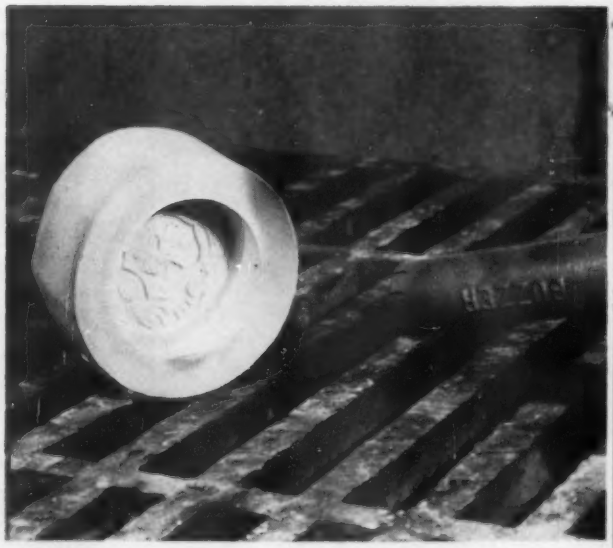
Universal checking fixture accurately calibrates the angular relationship and center to center distance between faces of end fittings on flexible hose assemblies of any size. Fixture is also used for recording information from a mock-up line by installing the templet in the fixture and reading off angles and distances. Considerable savings in manhours and tooling costs have been achieved with the use of this design because individual checking fixtures, and their modification to meet design changes for each flexible hose assembly, have been eliminated

Original and cast duplicate are identical, in this case, within ±0.003 in./in. Casting may now be used as stamping die

1 Shaw process starts with mixture of liquid binder and jelling agent, into which is blended powdered refractory. For larger job, mixing can be done mechanically

Quicker dies, Lower costs with Shaw process

Add to the list of special casting methods a new ceramic-mold technique that's especially valuable when only a few pieces are required. Make a pattern, cast and strip off a flexible mold, then treat the mold to harden it. Result is a tool for making die-casting, plastics, and forging dies to high accuracy



4 Firing with gas torch burns out volatile elements and mold hardens and crazes minutely

Tools and dies of intricate shape can be cast in any metal from simple patterns or prototype parts by a five-year-old British process recently introduced in this country. The method will produce tooling elements and short-run production parts with as much accuracy as lost-wax casting, but without expensive tooling. One of the important advantages is that

2 **Model is fitted with cardboard sleeve,** then mixture is poured over it

3 **After setting, mold can be stripped** off easily. At this point mold is flexible, resilient, but returns to dimensions after flexing

5 **Mold is completed** with same material and assembled for pouring

6 **Metal duplicate of model** is result after hard mold is broken up

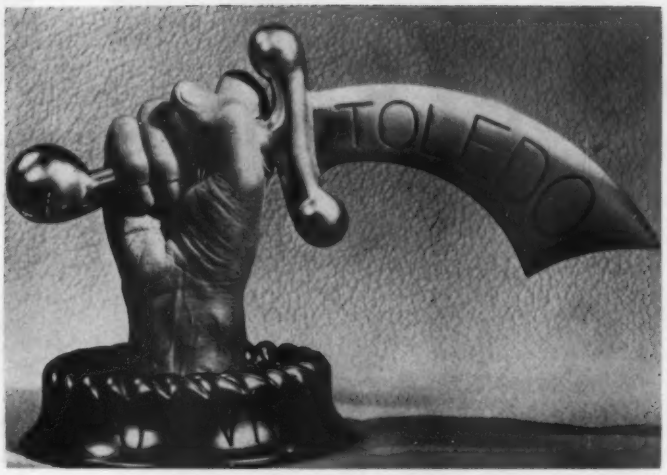
large bulky parts with varying wall thicknesses can be cast—up to a half-ton limit at present.

Key to the method is a casting slurry made by mixing a jelling agent with a colloidal suspension of silicate in alcohol, then adding a powdered refractory. After the mixture is blended, it is poured over a pattern, where it solidifies within several minutes into a rubber-like condition. In this form the mold can be stripped off easily, even if the pattern includes negative drafts and undercuts. The mold returns accurately to cast dimensions after flexing.

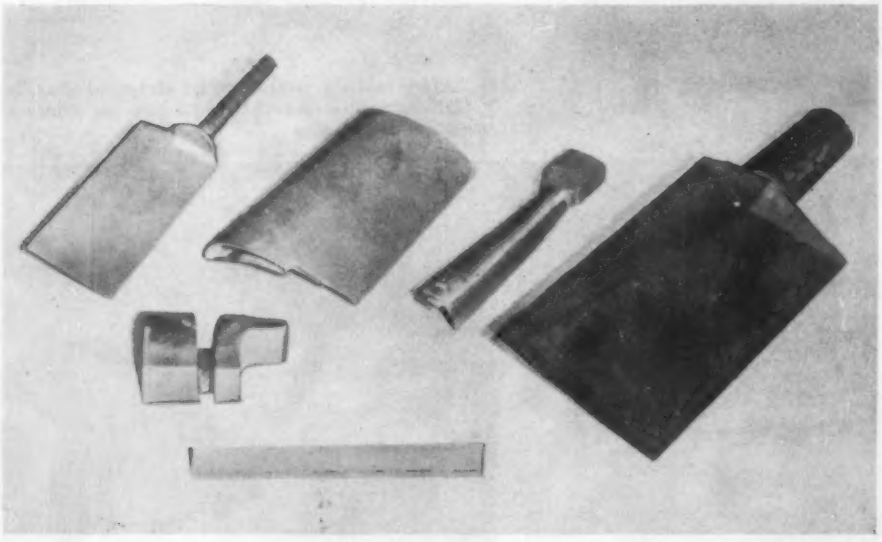
Then the mold is fired in a gas flame to burn out the alcohol and drive off volatile products, which

PLEASE TURN PAGE ▶

Quicker dies, lower costs with Shaw process . . .



Fine detail was maintained through process, producing skin wrinkles that duplicate original hand used as a model



One current use for process is in making small-lot turbine blades and guide vanes to close tolerances

converts it into a solid, hard ceramic mold with minute crazing throughout. Far from being a defect, this cracking helps produce sound castings by allowing gases to escape when metal is poured. The final mold is immune to spalling, washing, and thermal shock, and is ready for cold pouring within one or two hours after the mixing started.

Compared to lost-wax casting, the process is much faster for short runs, and doesn't require tooling for making wax patterns. It is a two-step process that can use any convenient full-size model as a pattern, and the pattern may be used over and over again if a number of parts is required. It is more accurate than shell molding, and will produce castings accurate to 0.003 in./in. on small parts, and to 0.015 in. overall on large parts. Surface finish is usually in the range from 50 to 120 mu in., which indicates the reason why the Shaw process can be utilized for casting hard metals such as stellite and high-cobalt steels to form press tools. With this finish, only polishing and final grinding are required after heat-treatment, and rougher machining procedures are avoided. Thus, die-casting, forming, and stamping dies that will outlast HSS dies many times can be built.

Production parts are also made, although the process is expensive for long-run production. Such parts as turbine blades, jet-engine and fuel-system structural elements, and parts for guided missiles and aircraft have been cast. One British company with a Shaw foundry boasts that it can turn out a completed prototype part within three days after receiving a blueprint.

This new process is therefore an addition to other specialized casting processes, useful where speed is essential, or where accuracy requirements are high, or where other processes are too limited in the size or structure of parts they can produce.

MODERNIZATION MAKES A MILLION

FOR AMERICAN BOSCH

WILLIAM M STOCKER, JR, associate editor

From rags to recovery in less than two years is the rather remarkable contemporary history of the American Bosch Division of American Bosch Arma Corporation, Springfield, Mass. It is even more remarkable when you learn that the recovery program was planned and programmed from within; that, with a change in management and management attitudes, the brains to do this job were found right in the company.

American Bosch always has had good products and a sizable market for them, but through the years, including two wars, the profit picture has been anything but handsome. Something had to be done — and fast. Part of the problem was obsolesence; another part was habit. Probably the most costly condition was the lack of integration between key organizational activities. Management controls were incomplete.

In October 1955 a two-phase improvement program was launched. One phase covered manufacturing control while the other phase concentrated on plant modernization. Mandatory management-training and work-simplification courses, given one day each week, were established. A Production Program Planning Committee, consisting entirely of people from the company, later went to work on the problems of manufacturing control.

Today, the result of this program, now about 75% established, shows a proved saving of $900,000 per year plus a sizable additional gain from contingent benefits. Perhaps equally important, the entire company has had a moral and physical uplift that makes it sparkle.

This report is intended to offer a little of that sparkle to those who may, personally or economically, find it invigorating.

American Machinist

SPECIAL REPORT NO. 442

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MODERNIZATION MAKES A MILLION...

American Bosch is, today, the nation's largest independent manufacturer of Diesel fuel-injection equipment and an important producer of automotive and aviation electrical products, as well as jet engine components. The automotive industry has been a steady customer for more than half a century. Organized in New York City in 1906 as the Bosch Magneto Company, the firm moved to its present location in 1911.

Typical of the era's automotive skyrocket, the year 1910 found this company producing 40,000 magnetos per month and by the year 1915 production was 400,000 magnetos per month. During that short period of five years, the automotive industry had found line production and a hungry market.

Now the plant at Springfield is several times as large as it was in 1911 and contains more than 10 acres of floor space. Much of the work done there calls for precision equipment and skilled personnel. An important part of the company's business depends upon fast customer service. Also, quality of product is essential.

All of the foregoing should indicate a healthy situation. The necessary elements are certainly present. Unfortunately, and with some philosophical considerations to the contrary, most businessmen measure a company's health in terms of profit. American Bosch wasn't healthy. The cost of maintaining quality and quantity was excessive.

The problem, all too common, was that the company had grown without *discipline*, without organizational integration. Obsolescence and inefficiencies were taking a heavy toll in both direct and indirect costs. Management controls were static rather than dynamic.

Where do you start to tackle a job of this kind? The new Management at American-Bosch decided to divide the task into two phases. One group would handle Manufacturing Controls and a second group would be responsible for industrial engineering on the physical problems of production facilities and layout. The latter phase was followed by physical relocation of facilities and finally there was a detailed review and refinement of the original plan.

The Manufacturing Controls phase was initiated by organizing a Production Planning Program Committee, which consisted of the Supervisor of Production Planning, the Supervisor of Inventory Control, Assistant to Production Manager, Tabulating Coordinator, Industrial Engineer, and Assistant to the Vice President and Assistant Division Manager. One of the interesting considerations about this committee is that it is composed entirely of people from within the organization; the people charged with responsibility for the functions to be improved.

With organization, direction, and leadership, these people were able to produce remarkable results in improving conditions which none of them, individually, had previously been able to overcome. This group found the answer in approaching the whole

Common parts control center, . . . handling 1800 items, eliminated the job of tabulating these parts monthly on 80,000 punched cards, half of which are shown (right), thus drastically reducing paperwork. These items cost not more than 10¢ per piece and their total represented less than 5% of the total inventory dollar. By the old method the cost of keeping records was more than the value of the parts

problem, rather than in applying effort to only a few specific areas. First the problem was analyzed. This step was followed by a study of each of the factors in terms of its influence on the overall problem. Then the recovery methods resulting from these studies were integrated.

In the words of the committee, "Our motto is Analyze, Organize, Deputize, and Supervise."

Program objectives, according to the chairman of the committee, were twofold:

1. To reduce overall costs and improve efficiency.
2. To reduce and control in-process and raw-stock inventories.

The chairman went on to say, "We analyzed all of the forms and procedures then currently in use. Almost immediately we found the need for a substantial improvement in our materials handling procedures. We also established, throughout our fabrication shops, M-day scheduling. And, all personnel involved in the system were analyzed, after which job descriptions were prepared and compared.

As a result of this study, we:

1. Removed 80,000 tabulating cards from our monthly production cycle on low-cost items.
2. Established 1800 low-cost common parts for an approved cash-in-pocket saving of $149,000 per year.
3. Shortened the tabulating cycle to a weekly basis by using the M-day system and thus greatly contributed to an overall reduction of more than $2-million in our inventory.
4. Saved more than $250,000 per year by reassigning approximately 80 people, in the indirect cost areas, as a result of the improved system which minimized duplication of effort.
5. Established a number of criteria and a number of suggested ground-rules which were passed along to the industrial engineering group for use in the physical rearrangement.

Now, our *initial* program is approximately 75% complete. However, additional work is being done to establish resident planning, a routing center, and a very rigid control, through tabulation of all 'A' category parts, which are our highest-cost items and can lead to big losses."

In the study of current (then) methods, two general areas were considered:

1. Indirect costs
2. Integration

One of the first steps was to prepare a flow chart for each item of paperwork and for each product. Thus, by comparing these charts, it was possible to determine not only points of duplication, but the unnecessary operations as well as essential steps which were being overlooked.

From the result of this study it was possible to prepare a set of flow charts proposing the new system and these charts also were helpful in preparing new job descriptions for each of the personnel involved in the program, as well as new operational procedures for each product. Now Management had a program and reasonably well-integrated control.

While the Manufacturing Control Program was proceeding, Industrial Engineering was studying the physical changes needed to improve the overall operation—of both the office and the shop. Its objectives were to shorten flow time and decrease the in-process inventory.

In this phase, the first step was to prepare a com-

New stock train, . . . using dollies to carry bin racks, provides comon parts where needed—and when. Common parts are replenished by bulk, for flexibility, rather than by count as in the old method. The latter (right) was by lot issue with individually packaged common parts issued a minimum of 12 times annually. Bulk handling has proved cheaper and faster for these low-cost items

MODERNIZATION MAKES A MILLION...

Five standardized tote pans . . . can be safely carried on simple dolly. Now one man can easily handle 10 to 15 pans. Formerly, pans were dragged or moved by hand truck, one or two at a time

"M-Day" scheduling, . . . or *manufacturing day,* was established throughout the plant. It means that all schedules are based upon actual working days, excluding holidays, instead of calendar days. With 37 M-Day signs throughout the plant, all orders are now scheduled on this basis. It has improved coordination between departments and simplified control

plete layout of the existing arrangement. The original plan, scaled to ¼ in. equals 1 ft, was mounted on the IE wall for ease in planning. As new ideas developed they were checked against the original layout by using transparent overlays, which were added in layers to show floor plan, utilities, machine-tool placement, etc.

The original layout was like that of a job shop—by machine groups or what is known as process grouping with all of the lathes, millers, automatics, grinders, etc grouped according to the type of machine. Heat-treatment, too, was done in a separate department. This arrangement is satisfactory when job quantities are small or when most of the operations can be completed on one machine.

When this layout was initiated, chances are it was best suited to the task then at hand. However, through the years the nature of the task changed. While the layout stayed unchanged, the products became more complex and order quantities increased. Thus, a great deal of handling, costly in a number of ways, was necessary to get parts from one operation to the next.

In addition to grouping the machines by type, most of the groups were separated from each other by partitions. It was estimated that each linear foot of partition created at least two square feet of unusable floor space, one square foot on each side. At a value of $10.00 per square foot of manufacturing space, a conservative cost if additional space had to be provided, the three-quarters of a mile (linear) of partitions removed in this program produced a $100,000 gain in floor space. And this was a by-product of improved handling.

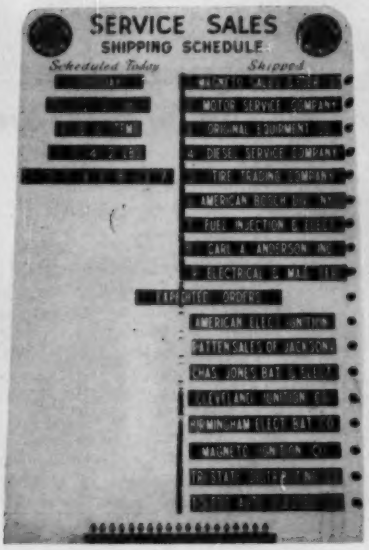
Now, as one enters the shop a blinking yellow light is seen on the far wall—1200 ft away.

Geared to today's and, they anticipate, tomorrow's manufacturing requirements, the new layout is by *product lines,* with all of the machine tools and equipment, including heat-treatment, needed to complete a given product or component in one uninterrupted line. Component lines are a part of product lines.

The main shop is about 1200 ft long by 200 ft wide. These new product lines are laid out the long way rather than across the width and a wide center aisle and only slightly narrower side aisles run the entire length of the manufacturing area to divide the lines and to improve materials-handling flow.

As a part of the general overhaul within the modernization program, all of the old, oil-soaked, wood floors—more than 50,000 sq ft of them—were torn up and replaced with concrete. It is felt that concrete is the most practical flooring from the standpoint of cost, speed of installation, housekeeping, and fire prevention.

To further improve appearance and productivity, all of the old lighting fixtures, which ran across the width of the shop, are being replaced by new fluorescent fixtures which parallel the aisles and the



Master shortage control . . . center provides a new method of instantaneous reporting and control of production shortages. Product managers are responsible for all major products as well as common parts and tools. A clipboard represents each of these items. Young lady at desk, in telephone contact with each department, posts shortages and advises responsible departments. A similar system has greatly speeded service and improved accuracy in master order control on service sales. As sales to service distributors are a key part of customer relations, improving this service was an essential part of the improvement program. Polaroid camera provides a simple daily report (right) of shipping status

Shipping department, . . . a far cry from its dark and jumbled predecessor, is conveyorized and sectionalized to provide both control and speed of handling. Items from inventory are brought from second-story stockroom by conveyor. Center boxes are used to accumulate small items until special orders are ready to ship to customers receiving frequent deliveries

manufacturing lines. Now every working area of the shop will receive between 50 and 100 foot candles of illumination.

In conjunction with this product-line layout, the main source of materials handling is provided by conveyors which run the length of each line. Secondary handling, for the "general machining" areas, is done with tote pans carried by specially designed dollies. The latter can be hooked up in trains and towed by a lift truck.

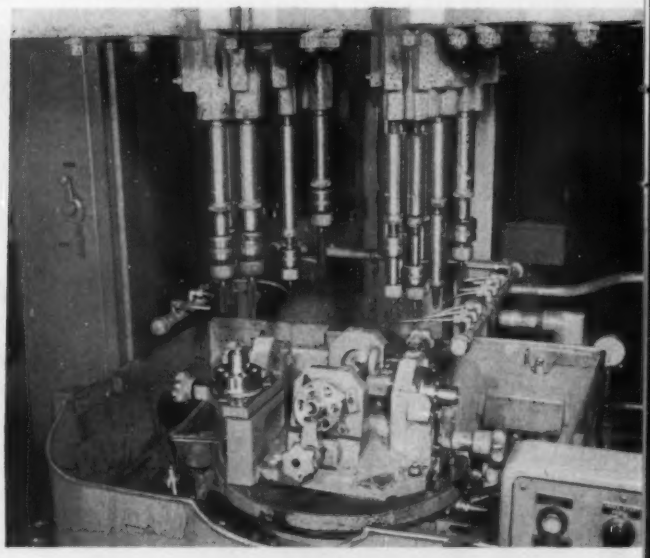
Two other projects were included in the planning by Industrial Engineering: An evaluation of manufacturing methods and a survey of the information exchange and activity relationship between the various offices within the plant. The latter survey was planned as a first step to relocating offices on the basis of their relationships; thus to improve communications and shorten work-flow lines as well as personnel travel. However, it has been put off for further study.

The office-relationship survey idea starts with a very simple chart, on cross-ruled paper, which contains duplicate lists of all of the offices within the plant—one list across the top of the form and an identical list down the left-hand side. A blank copy of this form is sent to the person in charge of each office, with instructions to pick his own office out of the left-hand column and indicate by number weights in each of the boxes under the list at the top his activity frequency with other offices in the plant.

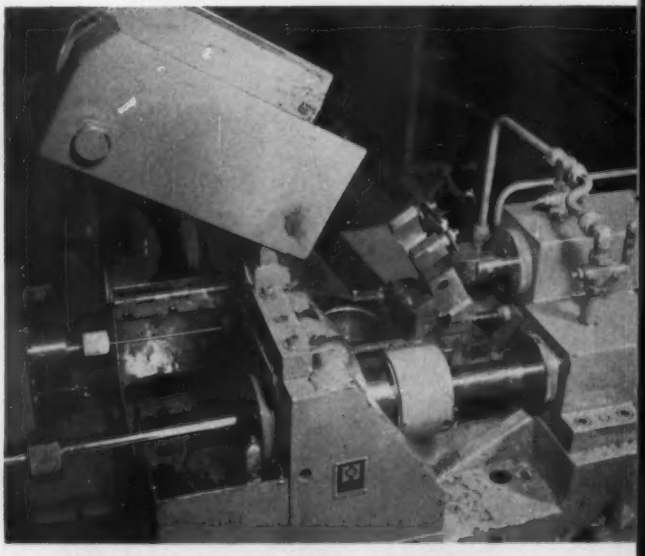
Four numbers provide the weighting:

1. Rarely

MODERNIZATION MAKES A MILLION...



Machine tools and tooling . . . are carefully selected to reduce in-process handling. This Natco automatic tapper taps 10 holes on the Nitralloy hydraulic head and 6 holes on the CI fuel-supply-pump housing (not visible) by indexing four times to complete one cycle and both parts. To handle two different parts simultaneously, the machine was equipped with a Barnes-drill chip separator to keep the chips of the two materials apart. Six of the twelve threads are dry-seal. A preset indexing switch eliminates unnecessary delay by enabling the operator to index the machine upon completion of machining at any one station. One of each piece comes off the machine in 2.2 min., or one-third of the original time

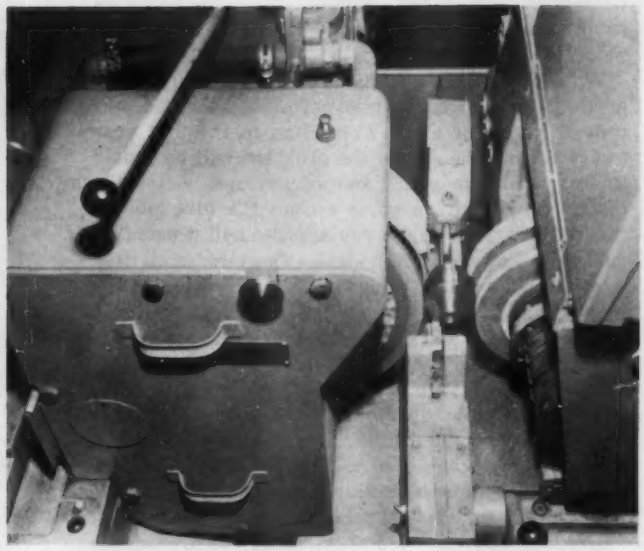


Gun drill, . . . especially built by Heald, is positioned in the conveyorized production line. Conveyor in left foreground brings work to operator and lower conveyor in background takes it to next operation. Conveyor at right foreground returns work for second gun-drill operation and upper conveyor in background takes pieces away from this section. Machine drills a large plunger hole and a small metering port. Certain intermediate operations prevent drilling both holes simultaneously. Savings in labor cost are 75% of cost by previous method and honing is eliminated. Holes are drilled concentric and square within 0.001 in., hole wall is finished to within 15 mu-in. rms, and bore bow does not exceed 0.0002 in. maximum. Fuel metering hole is 0.138 in. dia. During drilling of the plunger bore, the operator does a milling operation at an adjacent machine. Total cost of machine and fixture was $21,000. Drills are supplied by Eldorado Tool & Manufacturing Corp

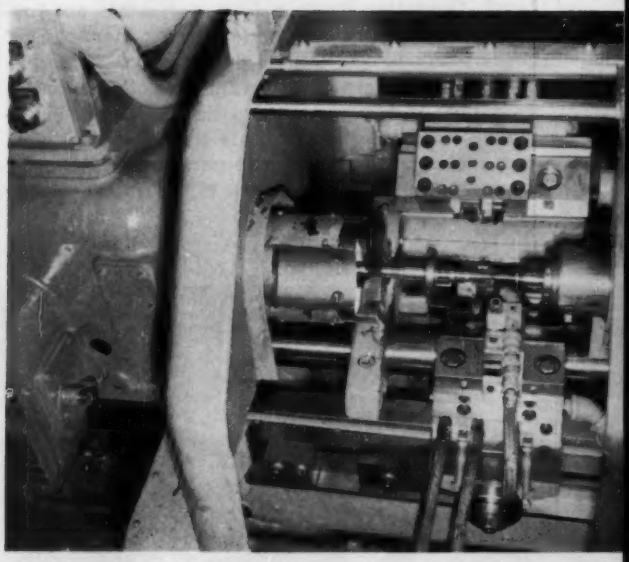
2. More than once each month
3. More than once each week
4. More than once each day

As each form is completed, one of the IE men discusses it with the person in charge of that office. Thus the interviewer is able to help establish a more accurate weight and also make notes about special conditions. The master survey totalling all of these forms is very helpful in rearranging office layout, with the largest figures indicating the greatest activities.

Evaluation of manufacturing methods is a continuing program of the methods engineering department, which is part of Industrial Engineering. Emphasis is on the elimination of in-process part handling—or the use of forms of "automation" which suit the nature of the product. Based upon careful study, a number of new machine tools have been



New method concept . . . which greatly simplified the in-process handling problem originated with this Cincinnati No. 2 centerless grinder which grinds two diameters and one face square with them. Diameters are held within 0.0005 in. Face, produced by hand actuated reciprocating motion of wheel, is controlled only for squareness with diameters to establish locating points that will be constant throughout the line. Stock removal, which caused trouble at the beginning, is not controlled. This machine and fixture combination, costing $13,248, combines two grinding operations from centers into one faster operation and, in conjunction with the Heald gun drill, eliminates three very costly grinding operations



Eliminating four lathes . . . and three grinding operations, this 8 by 33 Fay automatic lathe, costing $17,021 inclusive of the fixture, performs all of the turning operations on the PSB camshaft in two stages. Automatic cycle permits operator to run centering machine directly behind him

purchased because of their ability to consolidate operations as well as minimize setup time and special tooling. Some machines are standard while others are especially designed for the job.

Even heat-treatment is included as part of the process line. Formerly a departmentalized operation, the furnace was moved right into the conveyor line to nitride 900 parts at a time in a 56-hr cycle. The daily requirement is 300 of these parts hence banking a three-day supply per cycle keeps the line moving with a minimum of in-process delay. And parts don't wait their turn in Heat Treat.

Physical relocation of the machinery and equipment, after the proposed layout was approved, was the next phase of the Industrial Engineering assignment. This task was accomplished *without any loss of production* and with a minimum of week-end moves or overtime. A very carefully planned time schedule was prepared for each step of the move, based on the time estimated to move each machine, including a preparation of the area. Then by speeding up production for the necessary period before the move, parts were banked to meet the delay during the move.

For example, a delay estimate of 24 production hours at ten parts per hour would be met by increasing pre-move production by 20% for three 40-hr weeks or the equivalent.

One comical little anecdote is told about the period after relocation of the machinery. The committee thought that it would improve the appearance of the shop considerably if all of the machines were painted but the budget didn't include money for a job this big. So Maintenance painted a few machines at key locations and then *forgot* to put away the paint—just left it sitting out on the floor. Operators stayed after working hours, "stole" the paint, and painted their own machines. Strangely enough, not one person complained!

As part of the overall cost improvement program, each supervisor is given an annual "bogey" based on his departmental activity. Performance against this bogey is charted once each month. While it is understandable at this early stage that there would be considerable room for improvement, it is unusual for the bogey not to be exceeded by a sizable amount.

Quality control, too, received considerable attention under this modernization program. Inspection, handling, and machine capability were a major part of the product-line planning. Also, the planners took a new look at cleanliness. It is easier to keep parts clean in the first place than to clean them later. Now, large industrial vacuum cleaners which fit on top of a 55-gal. drum are used to collect chips from the machines as the parts are cut.

Management training was made a very definite part of the program, with emphasis on those areas which the various levels of Management control. The operating echelons, such as foremen, supervisors, and office managers are given a course in work simplification.

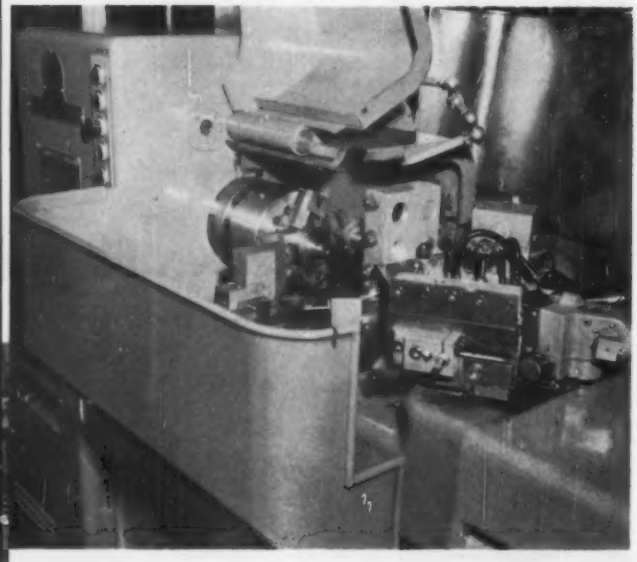
How do you measure results in a program of this

MODERNIZATION MAKES A MILLION...

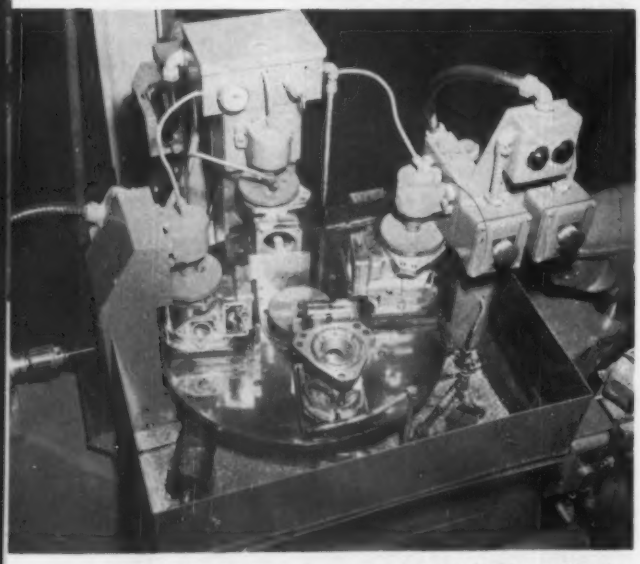
kind? Operating Profit & Loss statements are historical rather than dynamic. Here, Management needs a day-to-day control device which will indicate trends before they became serious problems. To supply this information, a simple ratio is maintained on a daily basis. It is the dollar value of raw material and purchased parts, plus the manpower requirement, versus the billing forecast. Any trend or sudden change on either side of the balanced ratio requires immediate action to determine the cause.

What can American Bosch hope to gain from expending nearly $2-million on modernization? A proved saving of about $1-million in the first year indicates that the cost of the program will be repaid in less than two years, out of savings. After the cost is repaid future gains are on the plus side of the ledger. And these savings do not reflect the contingent advantages to sales, service, and production, as well as other benefits, resulting from modernization.

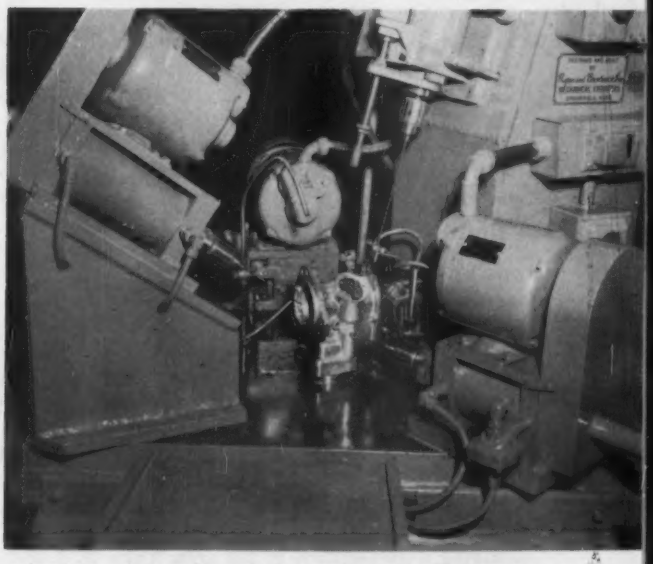
Many people do not realize that a saving of $1-million is equivalent to a tax-free increase in gross sales of better than $20-million. A great number of businessmen who wouldn't think more than twice about spending $2-million to guarantee an annual business improvement of $20-million would hesitate a long time before spending that kind of money on a program that said "modernization" instead of "sales." Yet, in this and many other cases, modernization brought an equivalent and much more certain return on the investment.



Four hand-operated turret lathes, . . . each requiring an operator, were replaced by two of these Potter and Johnston semi-automatic turret lathes—both controlled by one operator. At a total cost for both machines and the fixtures of $29,367, they turn, face, bore, and recess hydraulic heads at a quality level which has eliminated a face-grinding operation



Automation . . . comes even closer with this combination of two machines designed and built by Roper and Broderick, Inc, especially for American Bosch. One machine drills and taps, automatically, the lubrication oil holes in pump housings. To reduce drilling time, two drillheads are used with each of them drilling half of the total depth of 3⅝ in. When four-station indexing table is fully loaded, a part is completely drilled and tapped at each index of the table. This short cycle gives the operator ample time to run the machine within the time



cycle of the other machine which is at his right. These operations formerly were done on one hand-operated, three-spindle drillpress as were the operations now done on the second machine, which drills three angular holes in the pump housing. A 0.156-in. dia hole is drilled 3⅜ in. deep; a 0.125- in.-dia hole, 1⅜ in. deep is drilled to intersect the 0.156 in. hole and a ⅛-in.-dia hole connecting tappet bore with quill-shaft bore. Automatic cycle permits operation of both machines by one person. Total cost of both machines plus tools and fixtures is just under $11,000

Round Table...

School for Novices

"What's this 'basic engineering' course they're going to give in the plant, Al? Are they trying to get everyone out of the shop and into the drafting room?"

"It's not that advanced a course, Ed. As I understand it they're trying to get over a few simple principles of physics and mechanics so the new employees and those who don't know much about machines will get a vague idea of what's going on here."

"Sounds like a waste of time, Ed. And a good chance for some of the lazier ones to get some sleep on company time. Has Management thought about how much production time we'll lose?"

"It won't be that bad, Ed; only an hour a week, and half of that is company time, half is the employees' time. If anybody isn't interested enough to spend a half hour of his own time, that lets him out automatically."

"It doesn't make sense, Ed. What can they teach in an hour a week?"

"Well, the instructor is going to be guided by what the students don't know, or what they're curious about. Maybe they'll ask about our products; maybe about the power station. It's really a personnel-relations program in a way; but it should make some of the employees more hep about the many problems we have in a plant of this size."

"I'll give you odds that the class turns to sex in no time."

"It's the instructor's job to keep roughly to the subject, Ed. He's going to stick to mechanics."

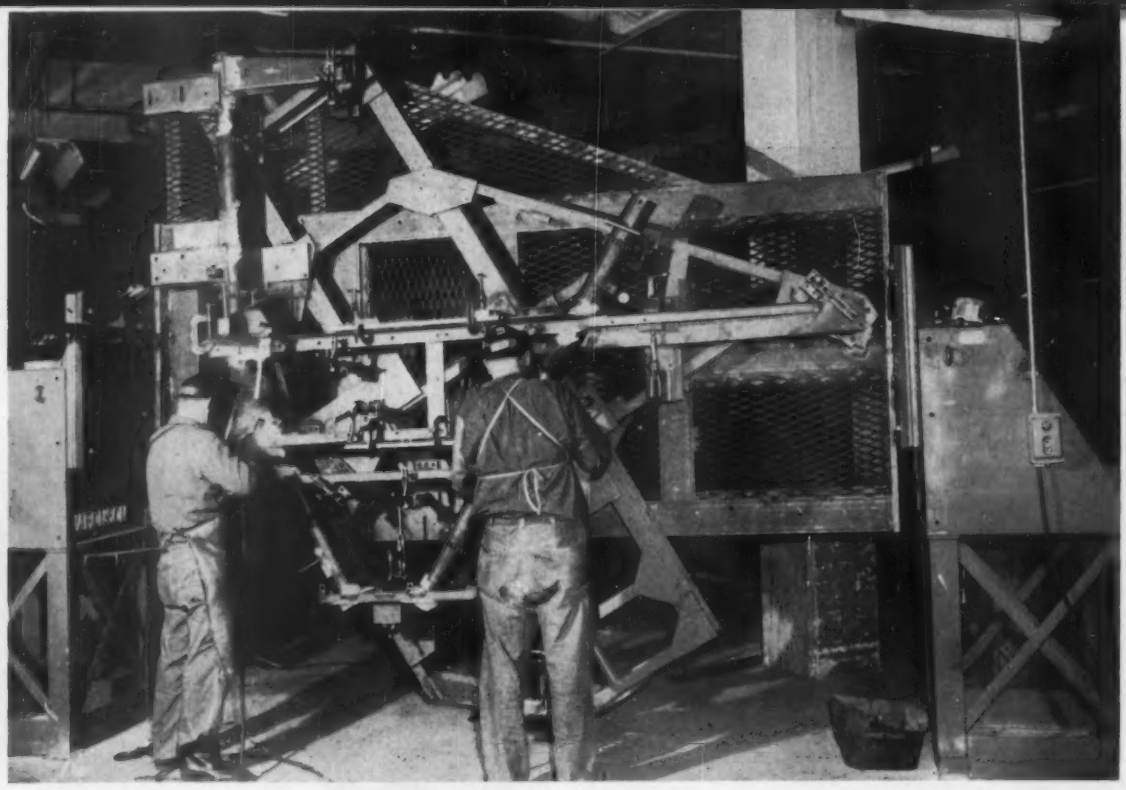
"What's wrong with night school, Al? There are plenty of courses the men can take if they're really interested."

"But there aren't any specific courses that apply just to this plant, Ed. Many workers are mildly curious about what goes on in other departments, and a lot of them would be interested in the theory behind a lot of things; like gears, for example. Maybe some of them want to know how those space heaters work; or how we pipe air under pressure all over the shop."

"I don't think anybody will sign up, Al. Sounds too much like company promotion."

• • •

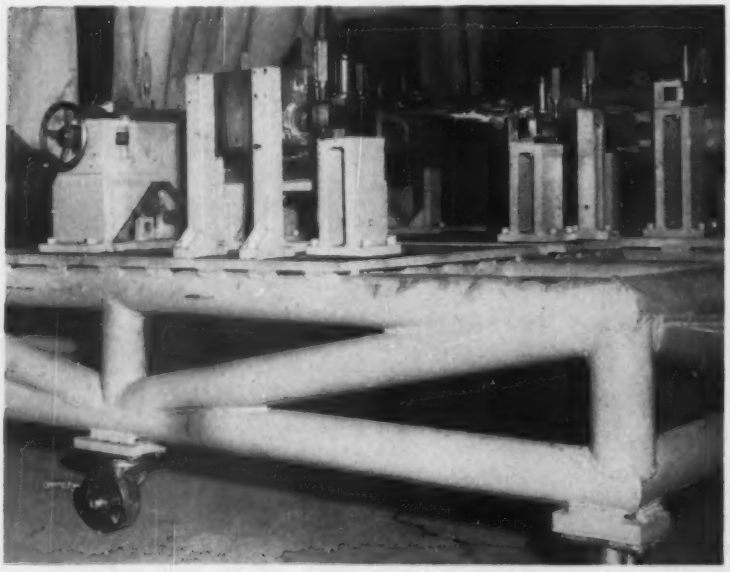
***SHOULD** a course be given to answer workers' questions about the plant they work in? Can Management spend the time and effort—and are there smart reasons for doing so? Or will such a course just collect all the loafers? Your ideas may help others. Discussions of earlier topics start on page 214.*



Special fixtures, such as this one for the main frame of a baler, are bringing interchangeability to agricultural machinery. This is a major benefit when . . .

Good fixtures expedite welding

C V GORECKI, superintendent of assemblies, MASSEY-HARRIS-FERGUSON, INC, BATAVIA, NY



Checking fixture for center distances on a baler-frame weldment. Tubular construction provides rigid base for platform plates that support blocks carrying gaging pins

Subassemblies and assemblies for agricultural machines are produced in quantity and must be interchangeable, so dimensions must be held within close limits. Good assembly fixtures are therefore essential. In some cases, separate fixtures are required to check critical dimensions and to help bring these within limits, if they show variations.

Welding fixtures are designed not only to clamp components in correct relative position, but also to bring each joint into convenient location for downhand welding. This saves time and improves operating conditions.

Many fixtures, therefore, are set in trunnions. For some large assemblies, a trunnion setup includes two Aronson positioners, one of which has a motor drive to permit rapid setting and locking in any

position. The second positioner serves as a tailstock to provide support at the opposite end.

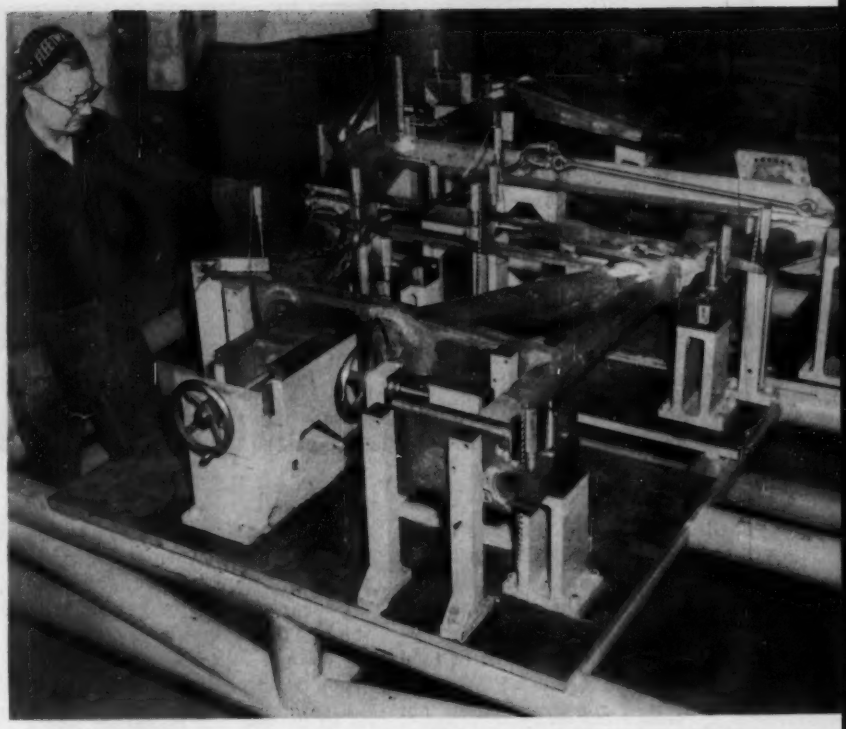
Main frames for the Ferguson baler include two large tubes and several other precut components, most of which are locked by toggle clamps. Tubes, however, are held by lengths of roller chain. Each such length is fastened to a fixed pin at one end and, after the chain is passed over the tube, has the other end locked by a toggle, drawing the tube tightly against a bearing.

This fixture holds seven subassemblies and four unit parts and is used for making 30 arc-welded joints, using E-6012 electrodes. As it is a large assembly, the axis of rotation is high above the floor; hence, when the plane of support is horizontal, as it is for many joints, weldors must work well above the floor. To avoid using portable scaffolds or ladders, the fixture includes wire mesh, nonslip flooring on which operators work safely at convenient height.

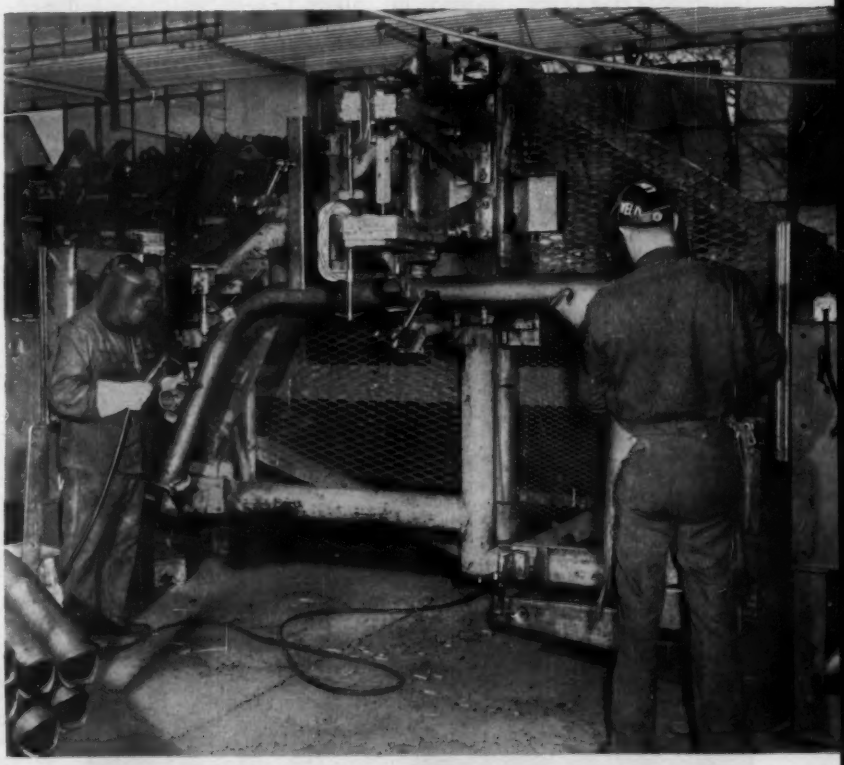
Two weldors, working together, tack weld all joints, and then make the final welds, following the specified sequence that has been found to result in a minimum of distortion. This is important because the frame assembly involves several locating holes for attachment of other components and must be held within close center distances.

After all welds are completed, the assembly is placed in a checking fixture. This has a base made from large-diameter tubes welded to form a rigid structure. After this base was stress relieved and machined, blocks with the necessary locating holes were bolted in place. Locating pins must pass into the blocks through corresponding holes in the frame weldment. If they do not enter freely, suitable corrections for warpage must be made.

On the checking fixture are some slides operated by handwheels. These slides carry certain locating-hole blocks that are moved when loading and when flame heat is applied to portions of the weldment to bring particular dimensions within limits. After heating, these slides are returned to correct gaging position and pins are again ap-

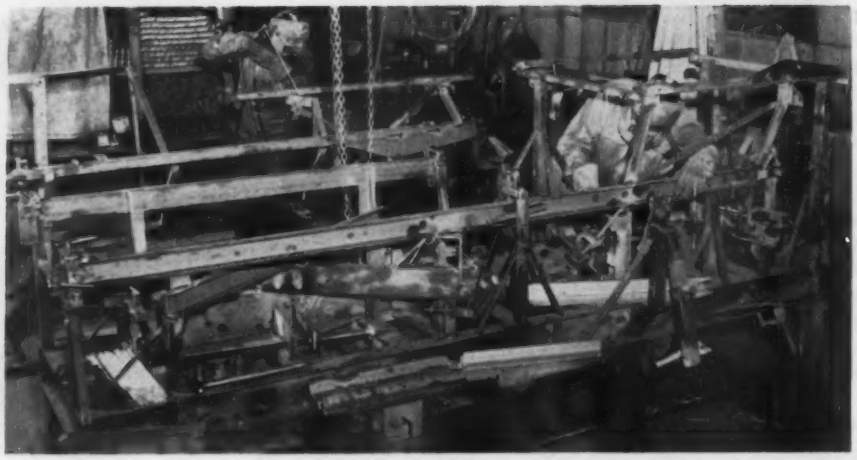


Baler frame in checking fixture. Gas torch may be applied to frame components to bring hole centers into correct location so pins will enter gaging holes freely



Frame for Ferguson forage harvester is welded in fixture mounted on two positioners that turn it into most convenient position for downhand welding

Good fixtures expedite welding . . .



Two fixtures for assembling frames for Massey-Harris dipper combines. One at rear is for tack welding only. Final arc welds are made in front fixture that can be rocked for downhand welding

plied for checking. For the frame to pass inspection, all pins of the fixture must fit mating holes freely. To achieve this, the operator must acquire considerable skill in applying the correct amount of heat at proper points, but he does this so well that the frame does not require subsequent machining to bring all locating holes within the specified center location. Certain squareness checks are also made in the fixture.

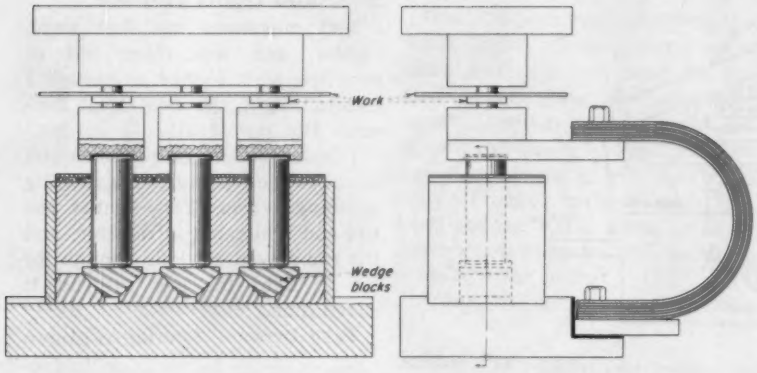
Another trunnioned welding fixture, similar to that for the main baler frame, is employed in welding the frame for a Ferguson forage harvester. Again, two Aronson positioners provide the trunnions and means for setting the fixture into positions most convenient for welding. Main components of this frame are large-diameter tubes, one having two bends that have a tendency to change dimensions somewhat when welding heat is applied.

Use of a sturdy fixture helps to minimize warpage, but it is necessary to employ a separate checking fixture, similar to that described above, to keep locating-hole dimensions within required spacing. Some torch heating is done in the checking fixture to bring certain dimensions within limits.

Still another main frame involving many arc welds is that for the Massey-Harris clipper combine. In this instance, the components are chiefly channels and angles. These are tack welded from precut lengths in a light locating fixture, then the frame is clamped securely in the welding fixture in which all welds are completed. With one man making the tack welds in the locating fixture and one working at the welding fixture, 22 frames are completely assembled per 8-hr shift. Included as fixture accessories are containers for supplies of electrodes and for some small frame components that are added in the welding fixture. Each fixture has its own Lincoln welding machine.

Lighter than some other major assemblies produced in this plant is a unit termed a "table," employed in the Ferguson forage harvester. This weldment is a combination of tubes, bars and 12-gage sheet steel. For this assembly, the fixture is mounted on a positioner plate that is inclined at an angle of about 45° and can be rotated in this plane. This enables two welders to work conveniently together and to make all welds in downhand position.

Assembling tubes, bars, and 12-ga sheet to produce forage harvester table. Fixture is mounted on inclined positioner table and can be turned as required for maximum convenience



Wedge Blocks Equalize Tip Pressure

Our aim was to find a method of applying equal pressure to several spotwelding tips working in unison on materials of varying thicknesses. Other means, such as putting beeswax or rubber pads under the pistons, had been tried but didn't work.

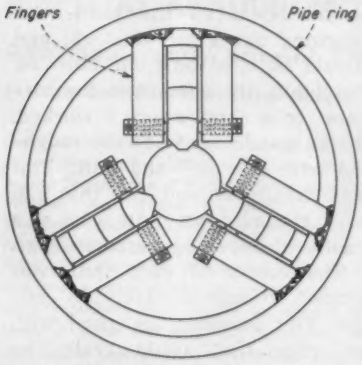
The simple but foolproof solution is shown in the accompanying drawing. As the workpieces are located for spotwelding to a common plate, the wedge blocks compensate for any variation in thickness.

Should a piece heavier than the rest be inserted, it would force the piston and its wedge block down, displacing the other blocks. This will cause the remaining pistons to rise until the pressure on all parts has been equalized for uniform contact.

The wedge blocks are housed in a slot milled in the bottom of the piston-holding block. Each of the sliding blocks has an included angle of 90°. The end blocks serve to fill the corners, and have one side each at 45° to match the sliding blocks.

We have two of these fixtures in operation, and have had satisfactory results for over a year.

Alex W Knudsen, Rocky River, Ohio



Jig Holds Jaws For Equalized Regrinding

The strain put on lathe chuck jaws is, for most part, abusive. In the majority of cases the work is held only in the front part of the jaws, creating distortion. This will eventually ruin the accuracy of a chuck and necessitate regrinding.

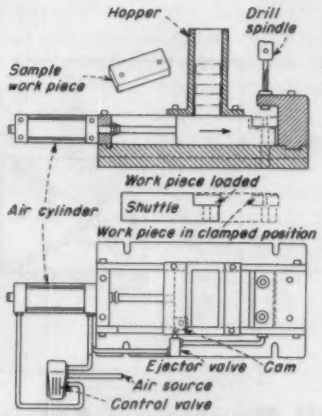
After having tried other types of jigs with only some satisfaction we decided to make one that would give us equal resistance on all jaws. The illustrated fixture shows the jig we made and have used with good results.

The outer ring was cut from a piece of extra heavy pipe. It was placed around the jaws so that the locations of the jaws could be scribed off. Six fingers were cut from square stock, drilled and tapped near one end.

Two fingers were clamped to a spacer bar, lined up with a set of scribe marks and welded to the ring. The spacer bar was made extra wide to provide clearance for jaw. The same procedure was followed in welding the rest of the fingers to the ring.

The jig was placed over the chuck. Setscrews were put in the tapped holes and evenly tightened on the jaws. To remove any excess play in the scroll and jaw ways, the jaws were tightened (about ½ turn with the chuck wrench) against the pressure of the setscrews. A toolpost grinder was used to true up the jaws, working from the highest point to the lowest.

Rex Bush, Columbus, Ohio



Pneumatic Drill Jig Loads Rapidly; Ejects Automatically

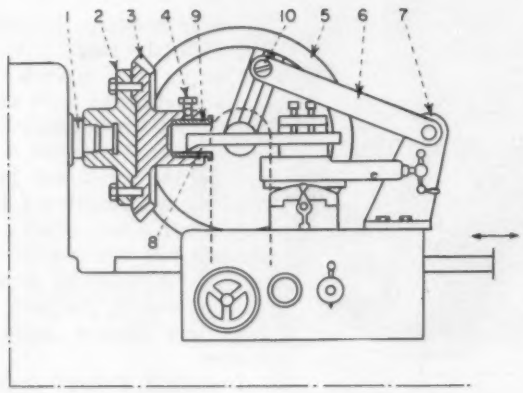
Not long ago we had an order for drilling two holes in thousands of small parts. Speed was essential, so we developed the illustrated jig with a direct hopper feed.

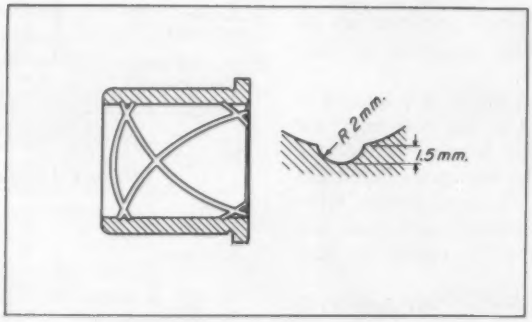
An air cylinder operates a reciprocating shuttle that picks up and holds each part for drilling. During the back stroke of the shuttle a cam triggers an air valve at the instant the part passes an opening in the opposite side of the jig. This ejects the finished work.

Control is by pedal, which operates the valve to power the shuttle into drilling position. When drilling is finished, the operator releases the pedal, and the shuttle returns to reload position to start a new cycle.

Hjalmar Dahl, Upplands Vasby, Sweden

Practical Ideas





Oil-Grooving Attachment Fits Any Lathe

A lathe attachment has been developed in the Soviet Union for cutting oil grooves inside bushings. It is claimed to work on any lathe of suitable size, and to be simple to operate. Principle of the attachment is shown in the accompanying illustration.

A bevel pinion (3) flanged to the lathe spindle (1) drives a bevel gear (5), which is mounted on a bracket supported on the lathe bed. The pinion has 48 teeth and the gear 64 teeth, which give a speed ratio of 3:4. In the bevel gear is a radial slot in which is locked at any desired radius a pivot mounting for one end of the steel linkage arm (6). The other end of the arm is pivoted to a bracket (7) which is mounted on the saddle of the lathe.

The lathe saddle is disconnected from the leadscrew so the linkage will make it reciprocate as the spindle rotates, taking with it the grooving tool (8). The bush to be grooved (9) is held in the bored end of the bevel pinion hub by the setscrew (4). As the work rotates the tool cuts a sinusoidal groove.

Axial length of the groove can be altered by adjusting the position of the pivot (10) in its slot in the bevel gear. The groove pattern for this gear ratio is completed in three reciprocations, corresponding to four revolutions of the spindle. Other groove patterns could be obtained by altering the tooth ratio of the bevel gears. In the example given, a 2-mm.-radius groove is being cut to a depth of 1½ mm.

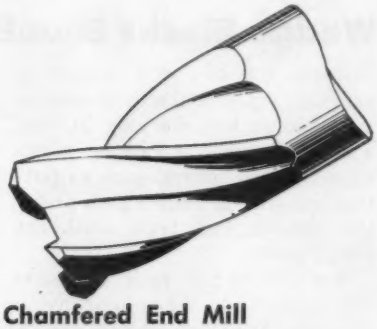
B J Kyukov and A B Pelish
(This device was originally described in "Stanki i Instrument" a Soviet monthly magazine.)

Steel Rod Lights Furnace

I had misplaced my flint torch lighter, and was clean out of matches; so it looked as though I couldn't light the heat-treat furnace. But not at all—

I took a length of steel rod and pressed it heavily against a running grinding wheel. This heated the rod end white-hot in no time, and the rod stayed hot long enough for me to light the gas with it. It saved time.

Fred Lettino, Astoria, NY



Chamfered End Mill Saves Finishing Cutters

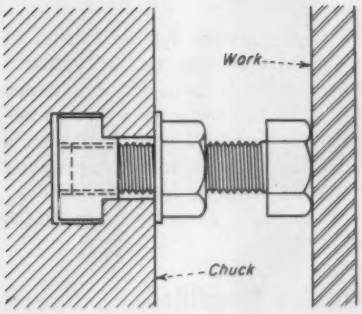
No one likes to be issued an end mill that has been burned, chipped, or otherwise mutilated. But I have often noticed a man choose a sharp end mill and use it to start and finish a job.

Good sharp-cornered cutters should be saved the burden of roughing out a lot of stock, and should be used only for finishing the depth, the sides, and the corners. In a shop where I worked, it was mandatory to do the roughing with an "old" end mill. This was usually an end mill that had been ground down quite a bit as a result of repeated resharpenings.

The corner of each flute was ground to approximately 45° angle. This provided the cutter with an edge that could really be "pushed" without burning or chipping the corners.

With the preliminary roughing done, the good cutter has very little work to do, a big saving in time and tool expense.

Joseph F Huber, Somerville. Mass



Facing Kink Assures Parallelism

We had a batch of large round steel plates to be machined on both sides within fairly close tolerances.

Four machine bolts were secured with T-nuts and jam-nuts in the T-slots of the chuck. Their lengths were equally adjusted to approximate position from the face of the chuck, relative to the height of the jaws and the thickness of the work. The jam nuts were then checked to see that they were firmly tightened.

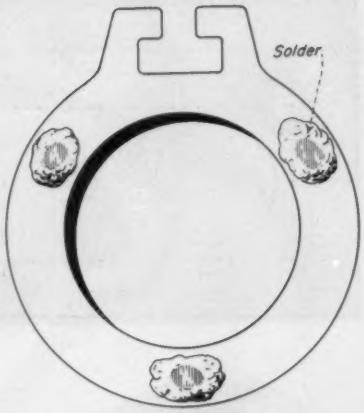
With the jaws removed from the chuck, small clean-up cuts were taken over the bolt heads to assure equal heights. The jaws were replaced, and the work positioned against the finished bolt heads. Before final chucking, we inserted a piece of paper between each bolt head and the work. These acted as feeler gages to insure that the work contacted the bolts.

Frank L Rush, Columbus, Ohio

Solder Provides Indicating Points

When the wedge or gate in a gate valve is off taper and needs machining, it is usually difficult to get an exact reading of how much has to come off and where. Since we do much of this kind of work in our shop, we had to devise some method of determining a setup.

We coat three spots on one face of the gate with a thin layer of solder. The gate is then driven into position to where the soldered spots are well indented. The gate is then carefully removed and set up in the lathe, where we indicate zero on the three solder spots.



Machining is done with a couple of finishing cuts, taking care not to remove more metal than is necessary to correct the taper.

R W Louwien, Bishop, Texas

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Additional yearly prize of $100.00

for the best Practical Idea published between Production Planbook issues . . .

Every contributor to Practical Ideas will now be eligible for two prizes; the regular $25.00 prize awarded for each issue, and a second Grand Prize of $100.00 to be awarded to the author of the Practical Idea judged the best in each Production Planbook. Planbook Practical Ideas are reprints of all the $25.00 winners published through the year; thus the winner of the Grand Prize will be a winner of winners. Rules for the Grand Prize contest will be the same as for the contest in each issue, except that the ideas considered must qualify by winning the $25.00 prize in the issues in which they originally appeared. Duplicate prizes will be awarded in case of a tie vote. Reader vote will be considered final.

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT — $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received — usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

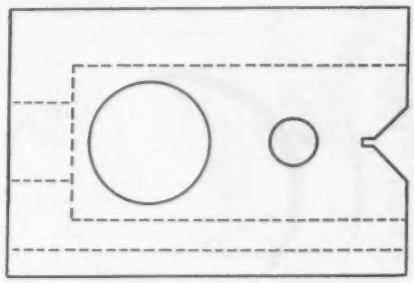
JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to every co-winner. Decision of the readers will be final in each case.

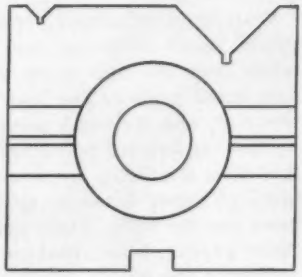
REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author — every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

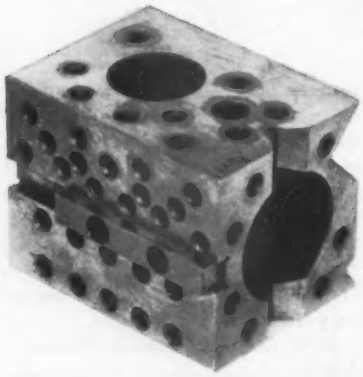
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

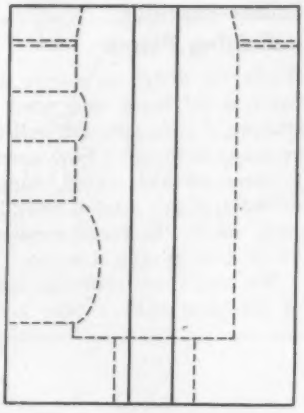
HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

Practical Ideas









Universal Setup Block

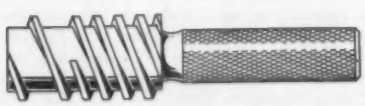
One of these blocks will prove very useful for layout or checking work on a surface plate. It is made of case-hardened steel carefully ground and stabilized, with the six faces exactly square and parallel so that any face can serve as a try square.

There are three V-grooves of different widths for lining up cylindrical work parallel with the faces. Several different size holes for holding parts with shanks or shoulare bored. There is a key slot to hold ground keys for lining up work with a square face, and a large number of tapped holes for holding work to be measured.

Once a piece of work has been attached to the block, all the dimensions can be measured by using one of the faces as a reference and by turning it over, as needed, to permit working in all three planes.

There are no limits to the size of block made, but 2 x 2½ x 4, 3½ x 4 x 7, and 4½ x 5 x 10 will be found conveninent for most work. All the tapped holes should be the same size and pitch, and the other holes can be made to suit the general run of sizes found in a particular plant.

Ch Minaire, St Etienne. France



Altered Gage Completes Check

In the case of multiple internal threads, it is virtually impossible to check each thread independently of the other with a standard gage. If the operator finds the gage will not enter the thread, he has no way of determining which thread is incorrect. One may be alright and the other undersize, or the two threads may not jibe.

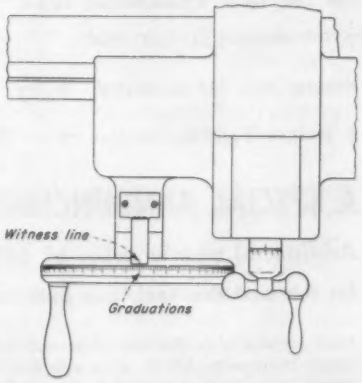
To detect exactly what is wrong with a thread, we have altered our gages so the second thread helix begins only after a full turn. Consequently, the first turn of each thread can be individually checked. If both threads check out O.K. but the gage won't go beyond the first turn, it is almost a sure bet there is something wrong with the relative lead.

Federico Strasser, Santiago, Chile

Turning Simplified By Graduations

We have a good number of lathes for toolroom work and short-run production jobs. To machine lengths up to a shoulder or depths of bores more convenient, we have cut graduations on the longitudinal feed handwheels.

The wheels were removed from the lathes, and a small flat was turned on the periphery on each. They were then set up on a dividing head and marked off in equal graduations, each line representing 0.010 in. of carriage travel. This selection was made because graduations appeared more distinct at this spacing. However, the choice of spacing will vary with each make of machine.



It is not difficult to determine the number of graduations that can be cut on a wheel. This can be done by carefully measuring the amount of carriage travel per revolution of the handwheel. Or the relative ratio of the gears can be used to calculate the distance.

A small plate bearing the witness line is attached to the carriage.

Clifford Molloy, Bronx, NY

lower cost *per piece with* surface broaching *of small parts*

■ Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

■ In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching, in many fields.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

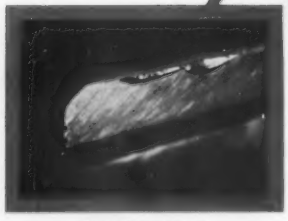
Engineered for production

FOOTBURT

PIONEERS IN SURFACE BROACHING

RED RING
HARD GEAR HONING
PRODUCES QUIET GEARS

Nicked Gear Tooth



Same Gear Tooth After Honing

Hard gear tooth honing is an entirely new approach to the vexing problem of intolerable gear noise arising from nicks, burrs, tooth roughness and minor heat-treat distortions.

Honing is not only far more effective than other processes used to combat gear noise but it is also much more economical. And it produces none of the undesirable after effects inherent in other processes such as heat checks, soft skin or residual stresses in the tooth metal.

Gear honing does four important things:

- Smooths off the swaged or raised metal surrounding tooth nicks.
- Eliminates burrs.
- Materially improves surface finish.
- Corrects minor heat-treat distortions in profile, index and lead.

When used as a final routine finishing operation following heat-treat, it eliminates the tedious and costly operation of searching for nicks and then correcting them. It improves the quality, uniformity and performance of all gears produced.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Patents pending

7631

Hourly production vs decimal minutes..I

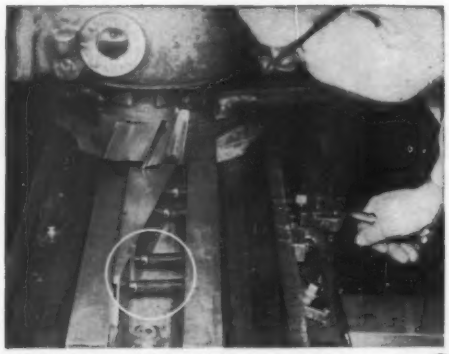
CARL W OLSON, supervisor, Standard Dept., HARRINGTON & RICHARDSON, INC. WORCESTER, MASS

DECIMAL MINUTES	EQUIVALENT SECONDS	DECIMAL HOURS PER UNIT	DECIMAL HOURS PER HUNDRED	RATE OF PRODUCTION PER HOUR	DECIMAL MINUTES	EQUIVALENT SECONDS	DECIMAL HOURS PER UNIT	DECIMAL HOURS PER HUNDRED	RATE OF PRODUCTION PER HOUR
0.01	0.6	0.000167	0.0167	6,000.0	0.56	33.6	0.00933	0.933	107.1
0.02	1.2	0.000333	0.0333	3,000.0	0.57	34.2	0.00950	0.950	105.3
0.03	1.8	0.000500	0.0500	2,000.0	0.58	34.8	0.00967	0.967	103.4
0.04	2.4	0.000667	0.0667	1,500.0	0.59	35.4	0.00983	0.983	101.7
0.05	3.0	0.000833	0.0833	1,200.0	0.60	36.0	0.01000	1.000	100.0
0.06	3.6	0.001000	0.1000	1,000.0	0.61	36.6	0.01017	1.017	98.4
0.07	4.2	0.001167	0.1167	857.1	0.62	37.2	0.01033	1.033	96.8
0.08	4.8	0.001333	0.1333	750.0	0.63	37.8	0.01050	1.050	95.2
0.09	5.4	0.001500	0.1500	666.7	0.64	38.4	0.01067	1.067	93.8
0.10	6.0	0.001670	0.1670	600.0	0.65	39.0	0.01083	1.083	92.3
0.11	6.6	0.001833	0.1833	545.5	0.66	39.6	0.01100	1.100	90.9
0.12	7.2	0.002000	0.2000	500.0	0.67	40.2	0.01117	1.117	89.6
0.13	7.8	0.002170	0.217	461.5	0.68	40.8	0.01133	1.133	88.2
0.14	8.4	0.002330	0.233	428.6	0.69	41.4	0.01150	1.150	87.0
0.15	9.0	0.002500	0.250	400.0	0.70	42.0	0.01167	1.167	85.7
0.16	9.6	0.002670	0.267	375.0	0.71	42.6	0.01183	1.183	84.5
0.17	10.2	0.002830	0.283	352.9	0.72	43.2	0.01200	1.200	83.3
0.18	10.8	0.003000	0.300	333.3	0.73	43.8	0.01217	1.217	82.2
0.19	11.4	0.003170	0.317	315.8	0.74	44.4	0.01233	1.233	81.1
0.20	12.0	0.003330	0.333	300.0	0.75	45.0	0.01250	1.250	80.0
0.21	12.6	0.003500	0.350	285.7	0.76	45.6	0.01267	1.267	78.9
0.22	13.2	0.003670	0.367	272.7	0.77	46.2	0.01283	1.283	77.9
0.23	13.8	0.003830	0.383	260.9	0.78	46.8	0.01300	1.300	76.9
0.24	14.4	0.004000	0.400	250.0	0.79	47.4	0.01317	1.317	75.9
0.25	15.0	0.004170	0.417	240.0	0.80	48.0	0.01333	1.333	75.0
0.26	15.6	0.004330	0.433	230.8	0.81	48.6	0.01350	1.350	74.1
0.27	16.2	0.004500	0.450	222.2	0.82	49.2	0.01367	1.367	73.2
0.28	16.8	0.004670	0.467	214.3	0.83	49.8	0.01383	1.383	72.3
0.29	17.4	0.004830	0.483	206.9	0.84	50.4	0.01400	1.400	71.4
0.30	18.0	0.005000	0.500	200.0	0.85	51.0	0.01417	1.417	70.6
0.31	18.6	0.005170	0.517	193.5	0.86	51.6	0.01433	1.433	69.8
0.32	19.2	0.005330	0.533	187.5	0.87	52.2	0.01450	1.450	69.0
0.33	19.8	0.005500	0.550	181.8	0.88	52.8	0.01467	1.467	68.2
0.34	20.4	0.005670	0.567	176.5	0.89	53.4	0.01483	1.483	67.4
0.35	21.0	0.005830	0.583	171.4	0.90	54.0	0.01500	1.500	66.7
0.36	21.6	0.00600	0.600	166.7	0.91	54.6	0.01517	1.517	65.9
0.37	22.2	0.00617	0.617	162.2	0.92	55.2	0.01533	1.533	65.2
0.38	22.8	0.00633	0.633	157.9	0.93	55.8	0.01550	1.550	64.5
0.39	23.4	0.00650	0.650	153.8	0.94	56.4	0.01567	1.567	63.8
0.40	24.0	0.00667	0.667	150.0	0.95	57.0	0.01583	1.583	63.2
0.41	24.6	0.00683	0.683	146.3	0.96	57.6	0.01600	1.600	62.5
0.42	25.2	0.00700	0.700	142.9	0.97	58.2	0.01617	1.617	61.8
0.43	25.8	0.00717	0.717	139.5	0.98	58.8	0.01633	1.633	61.2
0.44	26.4	0.00733	0.733	136.4	0.99	59.4	0.01650	1.650	60.6
0.45	27.0	0.00750	0.750	133.3	1.00	60.0	0.01667	1.667	60.0
0.46	27.6	0.00767	0.767	130.4	1.01	60.06	0.01683	1.683	59.5
0.47	28.2	0.00783	0.783	127.7	1.02	61.20	0.01700	1.700	58.8
0.48	28.8	0.00800	0.800	125.0	1.03	61.8	0.01718	1.718	58.2
0.49	29.4	0.00817	0.817	122.5	1.04	62.4	0.01735	1.735	57.6
0.50	30.0	0.00833	0.833	120.0	1.05	63.0	0.01750	1.750	57.2
0.51	30.6	0.00850	0.850	117.6	1.06	63.6	0.01768	1.768	56.6
0.52	31.2	0.00867	0.867	115.4	1.07	64.2	0.01785	1.785	56.0
0.53	31.8	0.00883	0.883	113.2	1.08	64.8	0.01800	1.800	55.5
0.54	32.4	0.00900	0.900	111.1	1.09	65.4	0.01817	1.817	55.0
0.55	33.0	0.00917	0.917	109.1	1.10	66.0	0.01832	1.832	54.6

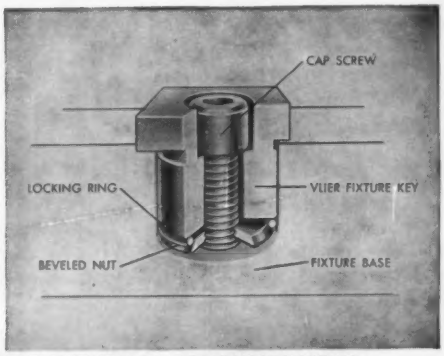
American REFERENCE

What can be done to lower YOUR tooling costs?

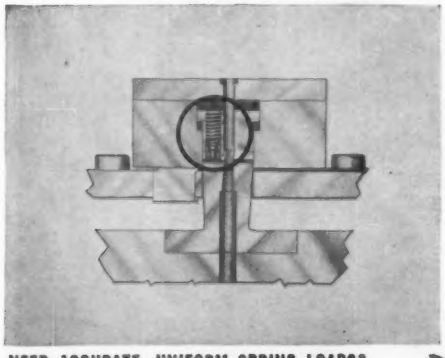
Thousands of companies are making drastic savings by using standard Vlier Tooling Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.



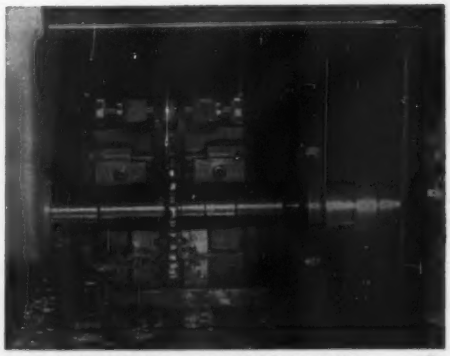
CLAMPING OFF-ANGLE PARTS in jigs and fixtures is a cinch with Vlier Swivel-Pad Clamps. Pad swivels on a ball, 7½° each side of center line. Can't bind or damage part surface. Socket set models can be inserted from either end.



NEW FIXTURE KEY WITH INSTANT-ACTING, INTEGRAL LOCK eliminates unnecessary drilling and tapping operations to mount keys in fixture base. Holds key securely, permits quick change of key size for different table slots. Insures perfect alignment of jigs and fixtures on table.



NEED ACCURATE, UNIFORM SPRING LOADS? Vlier Spring Plungers really pay off when positioning parts in jigs and fixtures. Spring loads are accurately set at the factory; stay constant. Plunger telescopes completely.



THE RIGHT AMOUNT OF CLAMPING PRESSURE AND NO MORE! There's no distortion of the part when Vlier Torque Thumb Screws are used to clamp it in the jig or fixture. Once predetermined end pressure is reached, the head turns freely. Working parts are protected from foreign matter.

Where can your tool room save?

Chances are, you can think of dozens of uses for standard Vlier Tooling Specialties—applications where expensive, complicated, home-made devices are now being used. *Why not write for your copy of the new 1956 Vlier catalog today?*

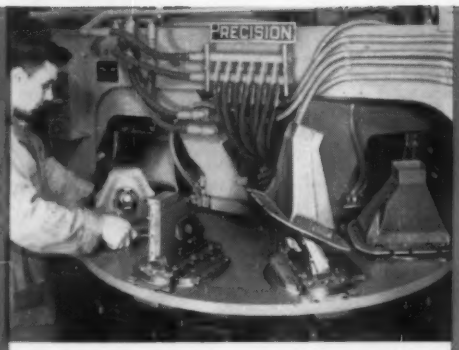
Originators of small parts that make a big difference in tooling costs!

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

Hourly production vs decimal minutes..II

DECIMAL MINUTES	EQUIVALENT SECONDS	DECIMAL HOURS PER UNIT	DECIMAL HOURS PER HUNDRED	RATE OF PRODUCTION PER HOUR	DECIMAL MINUTES	EQUIVALENT SECONDS	DECIMAL HOURS PER UNIT	DECIMAL HOUR PER HUNDRED	RATE OF PRODUCTION PER HOUR
1.11	66.6	0.01850	1.850	54.0	1.66	99.6	0.02765	2.765	36.2
1.12	67.2	0.01868	1.868	53.5	1.67	100.2	0.02785	2.785	35.9
1.13	67.8	0.01883	1.883	53.0	1.68	100.8	0.02800	2.800	35.7
1.14	68.4	0.01900	1.900	52.6	1.69	101.4	0.02820	2.820	35.5
1.15	69.0	0.01918	1.918	52.2	1.70	102.0	0.02833	2.833	35.3
1.16	69.6	0.01935	1.935	51.7	1.71	102.6	0.02850	2.850	35.0
1.17	70.2	0.01950	1.950	51.3	1.72	103.2	0.02865	2.865	34.9
1.18	70.8	0.01970	1.970	50.8	1.73	103.8	0.02885	2.885	34.7
1.19	71.4	0.01985	1.985	50.4	1.74	104.4	0.02900	2.900	34.5
1.20	72.0	0.02000	2.000	50.0	1.75	105.0	0.02915	2.915	34.3
1.21	72.6	0.02020	2.020	49.6	1.76	105.6	0.02930	2.930	34.1
1.22	73.2	0.02035	2.035	49.1	1.77	106.2	0.02950	2.950	33.9
1.23	73.8	0.02050	2.050	48.7	1.78	106.8	0.02965	2.965	33.7
1.24	74.4	0.02070	2.070	48.4	1.79	107.4	0.02985	2.985	33.5
1.25	75.0	0.02080	2.080	48.0	1.80	108.0	0.03000	3.000	33.4
1.26	75.6	0.02100	2.100	47.6	1.81	108.6	0.03020	3.020	33.2
1.27	76.2	0.02120	2.120	47.2	1.82	109.2	0.03035	3.035	33.0
1.28	76.8	0.02135	2.135	46.8	1.83	109.8	0.03050	3.050	32.8
1.29	77.4	0.02150	2.150	46.5	1.84	110.4	0.03070	3.070	32.6
1.30	78.0	0.02167	2.167	46.2	1.85	111.0	0.03085	3.085	32.4
1.31	78.6	0.02185	2.185	45.8	1.86	111.6	0.03100	3.100	32.2
1.32	79.2	0.02200	2.200	45.5	1.87	112.2	0.03120	3.120	32.0
1.33	79.8	0.02220	2.220	45.0	1.88	112.8	0.03135	3.135	31.9
1.34	80.4	0.02235	2.235	44.8	1.89	113.4	0.03150	3.150	31.7
1.35	81.0	0.02250	2.250	44.4	1.90	114.0	0.03170	3.170	31.6
1.36	81.6	0.02270	2.270	44.0	1.91	114.6	0.03185	3.185	31.4
1.37	82.2	0.02285	2.285	43.8	1.92	115.2	0.03200	3.200	31.2
1.38	82.8	0.02300	2.300	43.5	1.93	115.8	0.03220	3.220	31.1
1.39	83.4	0.02320	2.320	43.1	1.94	116.4	0.03235	3.235	30.9
1.40	84.0	0.02333	2.333	42.8	1.95	117.0	0.03250	3.250	30.8
1.41	84.6	0.02350	2.350	42.5	1.96	117.6	0.03270	3.270	30.6
1.42	85.2	0.02365	2.365	42.2	1.97	118.2	0.03285	3.285	30.4
1.43	85.8	0.02380	2.380	42.0	1.98	118.8	0.03300	3.300	30.3
1.44	86.4	0.02400	2.400	41.6	1.99	119.4	0.03320	3.320	30.1
1.45	87.0	0.02420	2.420	41.4	2.00	120.0	0.03333	3.333	30.0
1.46	87.6	0.02435	2.435	41.0	2.04	122.4	0.03390	3.390	29.5
1.47	88.2	0.02450	2.450	40.8	2.07	124.2	0.03450	3.450	29.0
1.48	88.8	0.02470	2.470	40.5	2.10	126.0	0.03510	3.510	28.5
1.49	89.4	0.02485	2.485	40.2	2.14	128.4	0.03575	3.575	28.0
1.50	90.0	0.02500	2.500	40.0	2.18	130.8	0.03640	3.640	27.5
1.51	90.6	0.02520	2.520	39.7	2.22	133.2	0.03705	3.705	27.0
1.52	91.2	0.02535	2.535	39.5	2.26	135.6	0.03775	3.775	26.5
1.53	91.8	0.02550	2.550	39.2	2.31	138.6	0.03850	3.850	26.0
1.54	92.4	0.02570	2.570	39.0	2.36	141.6	0.03925	3.925	25.5
1.55	93.0	0.02585	2.585	38.7	2.40	144.0	0.04000	4.000	25.0
1.56	93.6	0.02600	2.600	38.4	2.45	147.0	0.04080	4.080	24.5
1.57	94.2	0.02620	2.620	38.2	2.50	150.0	0.04165	4.165	24.0
1.58	94.8	0.02635	2.635	38.0	2.56	153.6	0.04260	4.260	23.5
1.59	95.4	0.02650	2.650	37.7	2.61	156.6	0.04350	4.350	23.0
1.60	96.0	0.02667	2.667	37.5	2.67	160.2	0.04445	4.445	22.5
1.61	96.6	0.02685	2.685	37.3	2.73	163.8	0.04550	4.550	22.0
1.62	97.2	0.02700	2.700	37.0	2.79	167.4	0.04650	4.650	21.5
1.63	97.8	0.02720	2.720	36.8	2.86	171.6	0.04760	4.760	21.0
1.64	98.4	0.02735	2.735	36.6	2.93	175.8	0.04880	4.880	20.5
1.65	99.0	0.02750	2.750	36.4	3.00	180.0	0.05000	5.000	20.0



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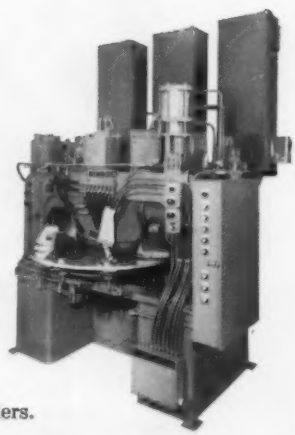

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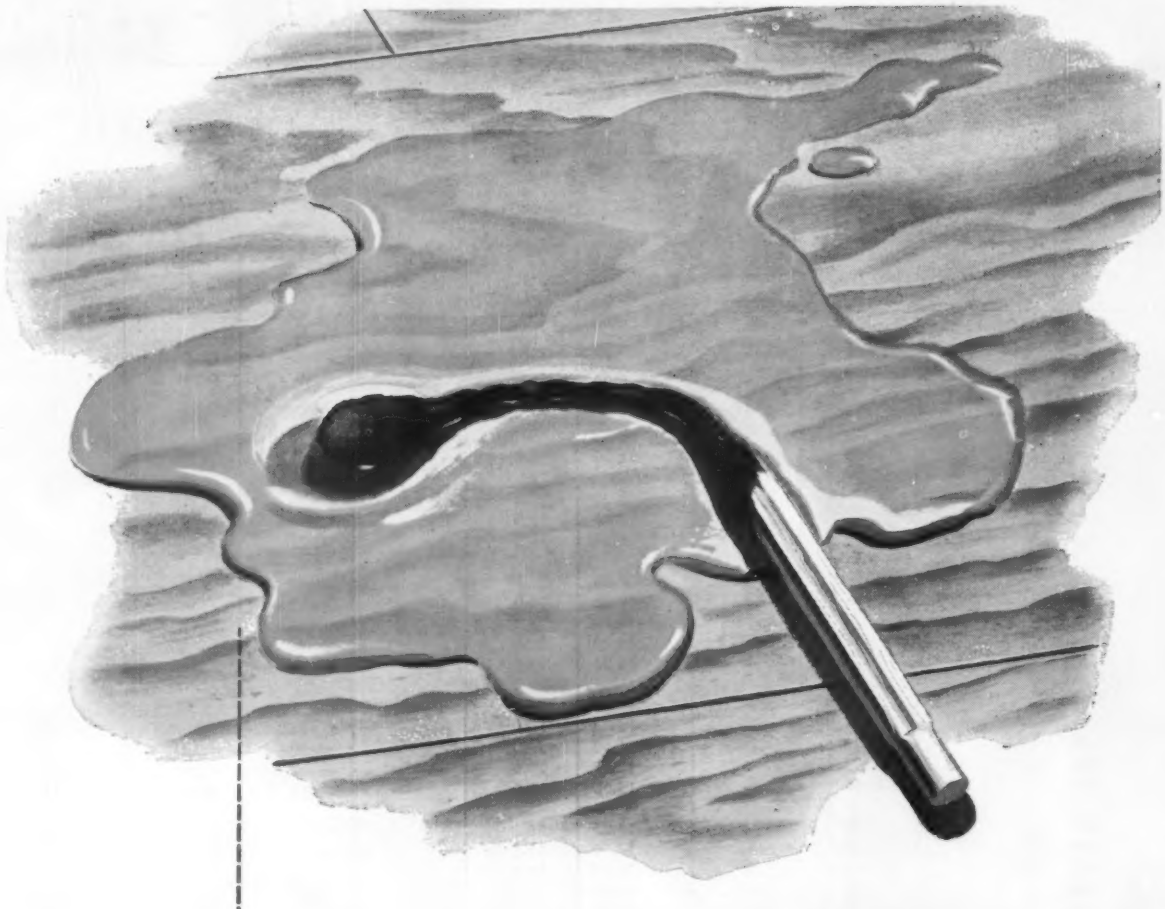
Hourly production vs decimal minutes..III

DECIMAL MINUTES	EQUIVALENT SECONDS	DECIMAL HOURS PER UNIT	DECIMAL HOURS PER HUNDRED	RATE OF PRODUCTION PER HOUR	DECIMAL MINUTES	EQUIVALENT SECONDS	DECIMAL HOURS PER UNIT	DECIMAL HOURS PER HUNDRED	RATE OF PRODUCTION PER HOUR
3.04		0.0506	5.06	19.75	10.00		0.1667	16.67	6.00
3.08		0.0513	5.13	19.50	11.00		0.1837	18.37	5.46
3.12		0.0520	5.20	19.25	12.00		0.2000	20.00	5.00
3.16		0.0526	5.26	19.00	13.00		0.217	21.70	4.62
3.20		0.0534	5.34	18.75	14.00		0.233	23.30	4.29
3.24		0.0540	5.40	18.50	15.0		0.250	25.00	4.00
3.29		0.0548	5.48	18.25	16.0		0.267	26.70	3.75
3.34		0.0556	5.56	18.00	17.0		0.283	28.30	3.53
3.38		0.0564	5.64	17.75	18.0		0.300	30.00	3.33
3.43		0.0572	5.72	17.50	19.0		0.317	31.70	3.15
3.48		0.0580	5.80	17.25	20.0		0.333	33.33	3.00
3.53		0.0588	5.88	17.00	21.0		0.350	35.00	2.86
3.58		0.0597	5.97	16.75	22.0		0.367	36.70	2.73
3.64		0.0606	6.06	16.50	23.0		0.383	38.30	2.61
3.69		0.0615	6.15	16.25	24.0		0.400	40.00	2.50
3.75		0.0625	6.25	16.00	25.0		0.417	41.70	2.40
3.81		0.0635	6.35	15.75	26.0		0.433	43.30	2.31
3.88		0.0645	6.45	15.50	27.0		0.450	45.00	2.22
3.94		0.0656	6.56	15.25	28.0		0.467	46.70	2.14
4.00		0.0667	6.67	15.00	29.0		0.483	48.30	2.07
4.06		0.0678	6.78	14.75	30.0		0.500	50.00	2.00
4.15		0.0690	6.90	14.50	31.0		0.517	51.70	1.94
4.21		0.0703	7.03	14.25	32.0		0.533	53.30	1.88
4.29		0.0715	7.15	14.00	33.0		0.550	55.00	1.82
4.36		0.0728	7.28	13.75	34.0		0.567	56.70	1.77
4.45		0.0742	7.42	13.50	35.0		0.583	58.30	1.71
4.53		0.0755	7.55	13.25	36.0		0.600	60.00	1.67
4.62		0.0770	7.70	13.00	37.0		0.617	61.70	1.62
4.71		0.0785	7.85	12.75	38.0		0.633	63.30	1.58
4.80		0.0802	8.02	12.50	39.0		0.650	65.00	1.54
4.90		0.0818	8.18	12.25	40.0		0.667	66.70	1.50
5.00		0.0835	8.35	12.00	41.0		0.683	68.30	1.46
5.11		0.0853	8.53	11.75	42.0		0.700	70.00	1.43
5.22		0.0871	8.71	11.50	43.0		0.717	71.70	1.40
5.34		0.0890	8.90	11.25	44.0		0.733	73.30	1.36
5.46		0.0910	9.10	11.00	45.0		0.750	75.00	1.33
5.58		0.0931	9.31	10.75	46.0		0.767	76.70	1.30
5.72		0.0954	9.54	10.50	47.0		0.783	78.30	1.28
5.86		0.0978	9.78	10.25	48.0		0.800	80.00	1.25
6.00		0.1000	10.00	10.00	49.0		0.817	81.70	1.23
6.25		0.1040	10.40	9.6	50.0		0.833	83.30	1.20
6.50		0.1083	10.83	9.2	51.0		0.850	85.00	1.18
6.75		0.1125	11.25	8.9	52.0		0.867	86.70	1.15
7.00		0.1167	11.67	8.57	53.0		0.883	88.30	1.13
7.25		0.1210	12.10	8.27	54.0		0.900	90.00	1.11
7.50		0.1250	12.50	8.00	55.0		0.917	91.70	1.09
7.75		0.1290	12.90	7.75	56.0		0.933	93.30	1.07
8.00		0.1330	13.30	7.50	57.0		0.950	95.00	1.05
8.25		0.1375	13.75	7.28	58.0		0.967	96.70	1.03
8.50		0.1417	14.17	7.05	59.0		0.983	98.30	1.02
8.75		0.1460	14.60	6.85	60.0		1.000	100.00	1.00
9.00		0.1500	15.00	6.67					
9.25		0.1542	15.42	6.49					
9.50		0.1585	15.85	6.32					
9.75		0.1625	16.25	6.15					



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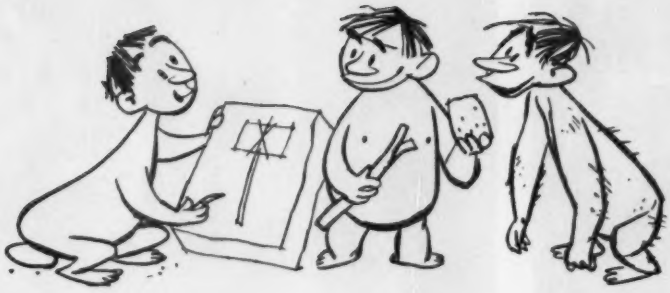
Talking Shop...



Hi, Do-er

AT the recent SAE National Production Meeting, President Paul Eddy said all the engineers in SAE could be divided into three groups: those responsible for research and development of products, those who produce them, and those who operate them. In short, he said, the dreamers, the do-ers, and the destroyers.

Help! Help!

ENGINEERS have again asked for help that will let them work more efficiently as a means of coping with the shortage of engineers. This time it came in a survey conducted by ASME at their annual meeting. Nearly one out of three who answered said the best way to deal with the shortage was to provide more technical assistants and clerical help for engineers. One out of five think higher salaries are the answer and one out of eight think the solution is to improve the prestige and recognition of engineers. Most of the engineers thought their high school had done a good job of preparing them for college, but half said today's high schools are not doing as good a job as their own had done. In contrast, 90% thought their colleges had done a good or superior job in preparing them and 86% thought the colleges were doing as well or better today.

Spin Test Chucks for Speed

ONE large metalworking company, with plants all over the country, is interested in trying ceramic-tool cutting wherever it appears economically practical. For safety reasons, this company has started an inspection and centrifugal test program, using spin pits, on all lathe chucks, faceplates, and rotating fixtures to be used at the high speeds which are best for ceramics. Some older chucks were found to have hidden cracks and other defects which lead to explosive failure. Other chucks opened enough under spin forces to permit the parts to drop out of the jaws. As safety insurance, readers testing or about to test ceramic tools should check their chucks and tailstock live centers carefully before going to high speeds. Use the caution with ceramic cutting that you would with grinding wheels.

Corking Good Apprentice

LIKE many a non-metalworking company, Armstrong Cork has extensive mechanical shops where much of the special machinery required for its 18 plants is built. To keep these shops supplied with skilled machinists, Armstrong has had an apprentice program since 1911. At the moment there are 26 apprentices in the 8000-hr course. Recently one of the current group, Frederick Suess, was named the outstanding apprentice of 1956 by the Pennsylvania Manufacturer's Association. Of graduates during the past 46 years, 10 are now in the management group and a large number have supervisory positions in the mechanical shops.

Germanium Flowers

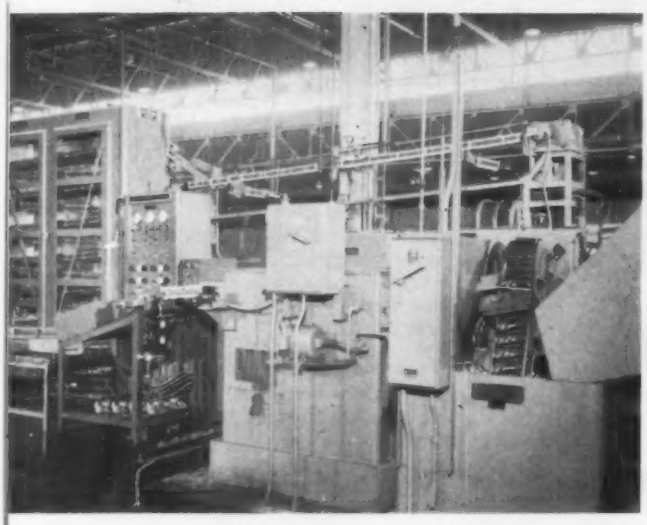
ONE of the things that made transistors possible was a wafer of germanium metal that serves as a rectifier. Now we're encountering this effect in something much larger than the transistor. Rheem Automotive Corp, for example, has installed 30 germanium rectifiers to produce 150,000 amperes of direct current to help power the bumper plating line in its Fullerton, Calif, plant. Light in weight, most of the units are placed on catwalks directly above the plating tanks. They have such disadvantages as a low thermal capacity, operating temperature limitations, and a susceptibility to current and voltage surges. However, these disadvantages do not influence overall performance for this application and they are said to provide both lower installation and lower operating costs.

Corrosion Down Under

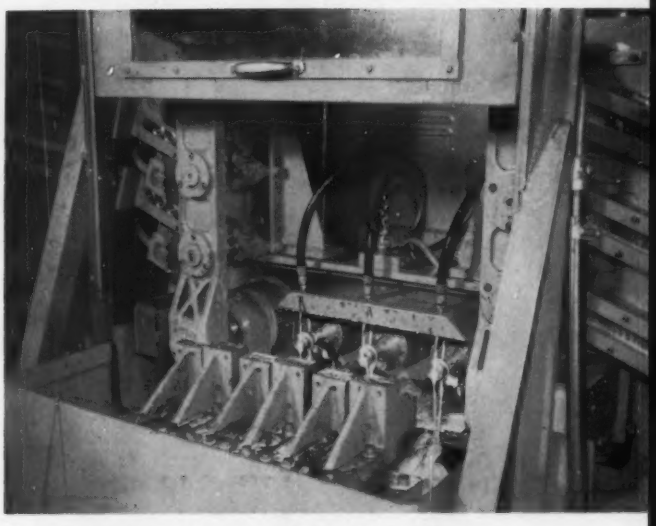
AUSTRALIAN scientists are reported enthusiastic about volatile corrosion inhibitors to prevent rust. Several steel panels have been protected for 4½ years by wrapping them in paper coated with dicyclohexylammonium nitrate. Similar long-term tests are under way using paper impregnated with dicyclohexylammonium caprylate. These tests were in normal atmospheres encountered in a laboratory. Ball bearings lubricated with grease and wrapped in volatile corrosion inhibitor-coated paper were protected for five to six months under accelerated test conditions which would normally start corrosion in packaged bearings in three days.

Hot Cat

EXCITEMENT verging on a nuclear explosion erupted when a cat frolicked with a ball of radioactive cobalt and then disappeared. It happened at the Westinghouse plant in Sunnyvale, Calif, during a recent noon-hour. A county health officer, with visions of a peripatetic cat spreading radioactive contamination, gave the alarm. A posse was hastily organized and it began to look dark for the cats of Sunnyvale when a Palo Alto physicist calmed the shattered nerves with the report that, while cobalt marbles are not suitable playthings for cats, this cat couldn't have picked up enough radioactivity to cause concern. The cobalt, incidentally is used to X-ray castings. It is kept in a cabinet but the cat extracted it during lunch and, growing bored, left it in the middle of the floor.



1 — Machined blanks from the bar automatics . . .
are lifted from a drop-bottom hopper (right) by slicer-bar elevator to overhead track that orients them with chamfered faces in one direction. Blanks go through washer (center), then to two-station Moore gage (left) that checks chamfer, bore squareness with faces, concentricity, and ID, OD, and overall length. Gage sorts blanks into out-but-salvageable, scrap, and OK categories, and delivers OK class to Michigan Tool "Gear-O-Mation" supply-on-demand unit that will store 3000 parts at once (far left)



2 — Two Ex-Cell-O three-spindle boring machines . . .
receive blanks from storage unit via power-conveyor distribution system and three gravity-feed tracks (left). Machines qualify all part faces and chamfer and turn the outside hub diameters. (They will also turn the OD's if necessary.) Parts bank up in the tracks behind proximity switches, but if a track empties, the switch releases parts at the distributor and the track gate is opened to receive them. Swinging pick-off arms position blanks on the spindles, which advance to the carbide tools on the toolblocks (foreground). Hub faces are squared with holes within 0.0005 in. tir. Rate is 460/hr at 100% efficiency at each machine

FORD automates gear production . . .

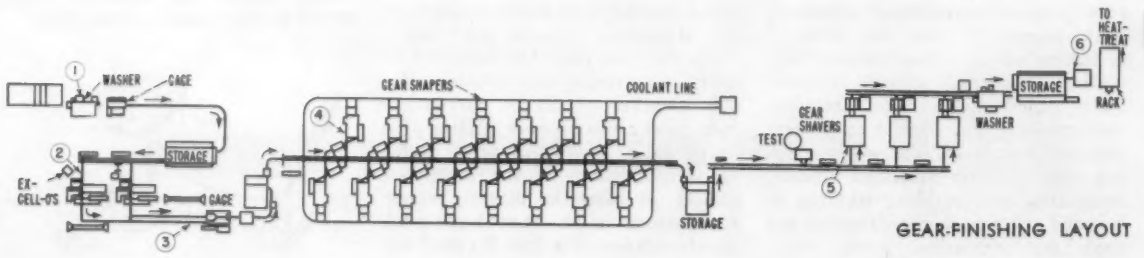
. . . and shows off the first completed of four gear-finishing lines that will be operating this year. Installation is at Ford's Livonia, Mich, Automatic Transmission Division plant. This pinion line is the latest in automation and represents a different approach to gear production as compared with Buick's pinion line (*AM*—Aug 1 '55, p111); and may also be considered something of an American answer to Russia's automated bearing plant (*AM*—Jan 14 '57, p147). It takes soft machined blanks and turns them into finished gears, ready for assembly. This line was a joint development of the Transmission Division and Ford's Manufacturing Engineering Staff.

GEORGE H DE GROAT, detroit editor

Engineering this gear-finishing line was a real job because every possible factor had to be taken into consideration. Each operation must have some effect on the one following, and on others down the line; so nothing could be left to chance.

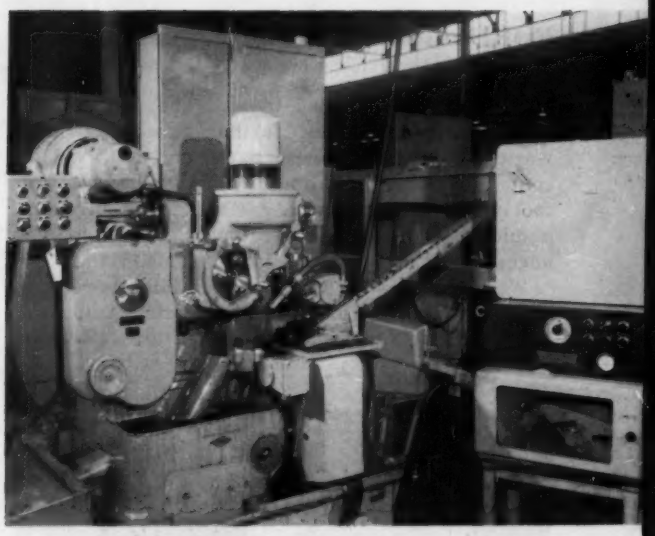
One problem was balancing production between machines with different rates, solved by new banking and storage units. Parts-distributing equipment, which handles all gears positively, is arranged to eliminate shutdowns when tool resetting or machine repair are necessary.

Automation is similar on all four lines, though the



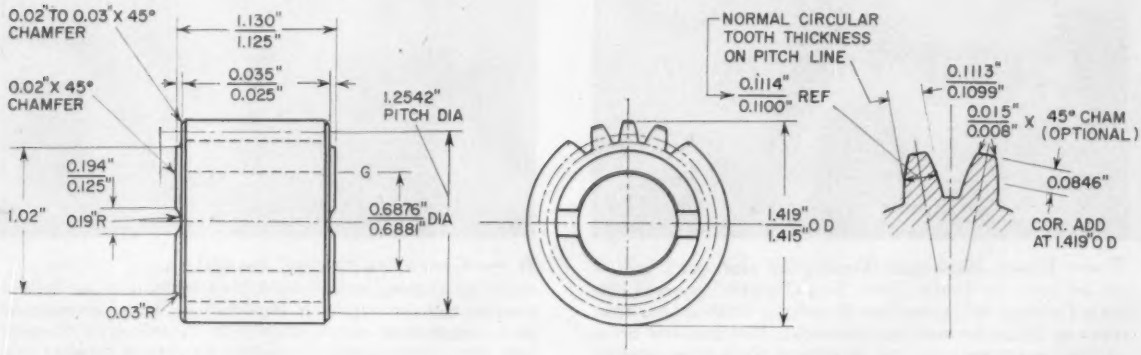
GEAR-FINISHING LAYOUT

3 — Six gravity-feed tracks . . .
take oriented blanks from both boring machines to a second Moore gage that also classifies the parts and delivers on-size blanks to a Lamb rotary storage and distribution unit (rear). Parts are clean at this point because air blowoff at the Ex-Cell-O's removed chips and coolant before pick-off arms placed parts in the tracks



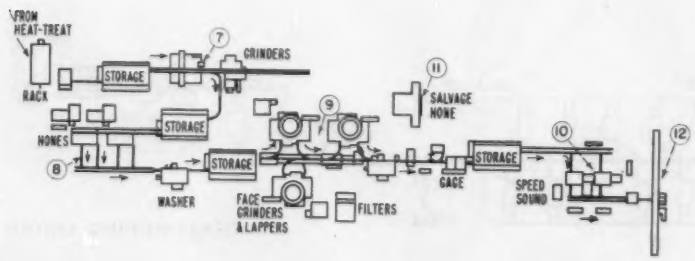
4 — Bank of 15 Fellows gear shapers . . .
receives blanks from central chain-belt conveyor when photo-electric cells signal a vacancy, which actuates storage unit to distribute parts. Accurate lead, profile, and tooth spacing are semi-finished at high speeds; cycle time for 18 teeth is 1.1 min @ 100% efficiency. After shaping and washing, gears go through pinion sizer (right) that inspects pitch and root diameters, then classifies them. If consecutive number of rejects is over a given value, sizer will stop the shaper. Parts are delivered to powered discharge conveyor via gravity chute, then to another Lamb rotary storage unit. Microflex counters stop machines after 150 gears for tool resetting

Pinion for automatic transmission . . .
is finished to close tolerances



first (pinion) line uses 15 Fellows gear shapers and the other three will be equipped with new Lees-Bradner single-spindle hobbers. Reason is part geometry; the gears produced on the other three lines have relatively wide faces and uneven numbers of teeth, so triple-thread hobs will cut three teeth at a time with hunting action on the remaining teeth.

Gaging and sorting follow each operation closely,



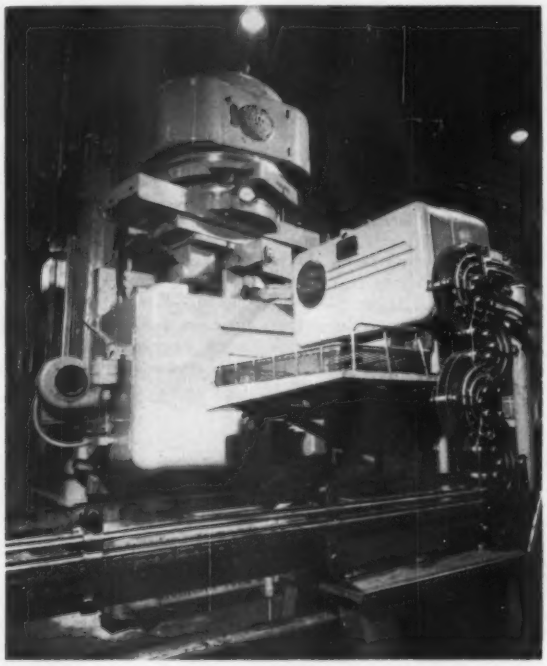
GEAR-FINISHING LAYOUT

and are electrically tied in with the cutting machines. This eliminates further processing (and wasted effort) on out-size parts, and allows gage control over compensating devices that correct for tool or wheel wear in some cases. It also allows economical salvaging of parts that can be repaired, gaged again, and put back into the line.

Washers follow a number of operations, to remove chips, coolant and dirt from the parts. Automatic chip removal and coolant filtration are important too, especially at the 15 gear shapers, for example, which are interconnected by two common pipes in a Hapman system that delivers chips to a portable hopper and clean coolant to a 15-gallon reservoir at each machine. This system handles a large volume of both chips and coolant.

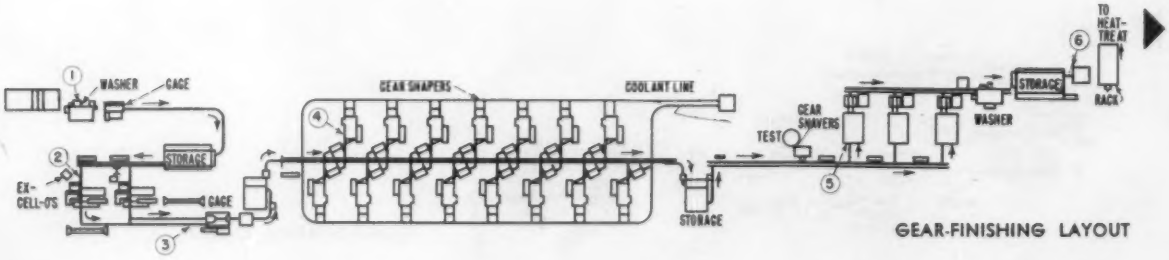
REAMING IS CRITICAL

A prime example of how one early operation can affect later ones has to do with the reaming opera-



5 — Three Michigan Tool gear shavers . . . are fed gears on demand from "Gear-O-Mation" powered conveyor. Left-hand helical teeth are shaved to a 0.0006-in. maximum crown at 300/hr per machine (at 100%). Michigan Tool probe selector (foreground) receives the gears to check pitch diameter, and to adjust the tool setting as required. It also segregates the parts into three classes, forwarding the OK gears to a gravity chute and "crippled" track conveyor that lowers the gears to a powered conveyor. Gears are washed, then stored in another "Gear-O-Mation" unit where they are held until unloaded for heat-treating

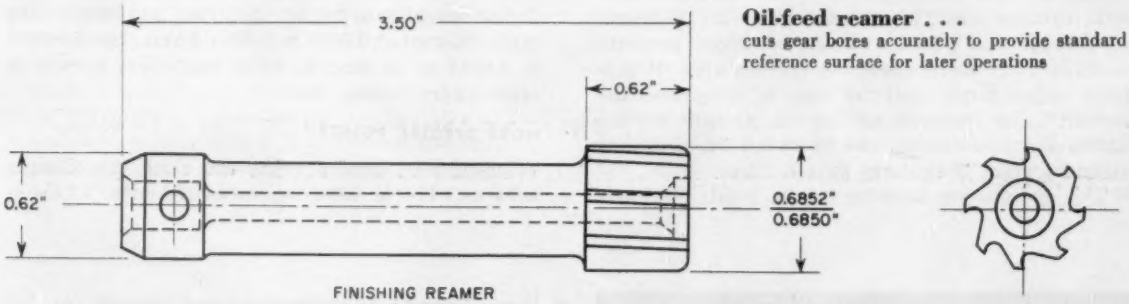
6 — Gears are "skew" loaded . . . out of an aligning unit by hand, then loaded into an inclined portable rack for transfer to heat-treating. Similar arrangement after heat-treating allows operator to "skew" rows of gears back into a stripping unit that delivers the parts to a storage unit.



GEAR-FINISHING LAYOUT

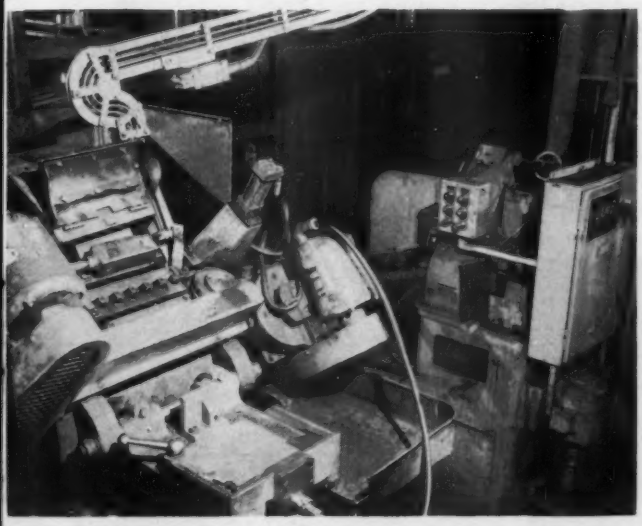
tion. Before the blanks get to the finishing line, they are turned and formed, the OD shaved, the hole drilled, reamed, and chamfered, and the blank is cut off. The reaming operation holds the hole size to 0.0006 in. total tolerance, the hole square with the blank faces within 0.001 in. tir, and concentric with the OD within 0.005 in. tir. As a result, subsequent operations can be performed accurately, working from the hole, without any additional boring or grinding.

The trick lies in using Barber-Colman oil-feed

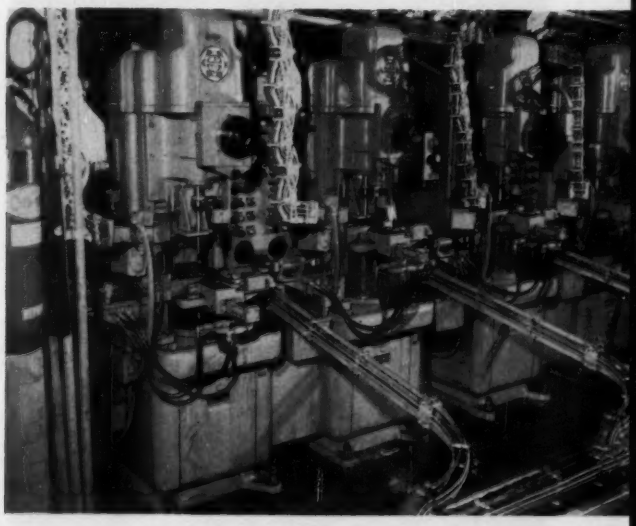


FINISHING REAMER

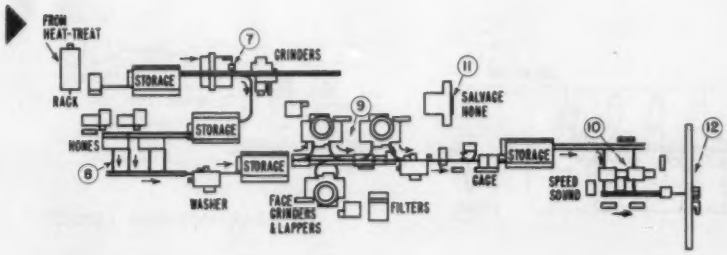
Oil-feed reamer . . .
cuts gear bores accurately to provide standard reference surface for later operations



7 — Two Joseph Lamb grinders . . .
process gears at 1800/hr (100% rate), receiving them from storage after heat-treating through distribution system and gravity feed. First machine (left) grinds acute-angle chamfers on both ends of teeth. Wheel is crush-dressed to tooth form, and gears are driven across its face by a rack. This keeps gears oriented and prevents damage to the teeth. Second machine (right) is an opposed double-wheel grinder that produces oil grooves on both faces of each gear at once. Both machines have self-contained coolant systems



8 — Two No. 738 Micromatic hones with double spindles . . .
remove about 0.002 in. of stock, taking the gear holes to 0.6876-0.6881. Built-in Moore and Sheffield gages segregate the parts and trigger the hones to reset their tools to compensate for variations. Each machine has coolant refrigeration, reclaiming, and chip separation. Because holes are reamed to close tolerances in the bar automatics, honing-stone life is increased to about 300 pieces (compared to 175 previously)



GEAR-FINISHING LAYOUT

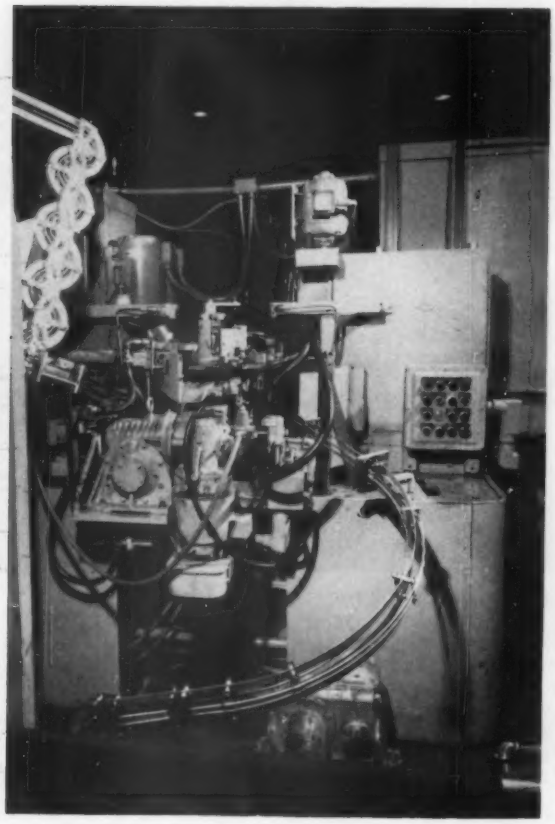
FORD automates gear production . . .

reamers held in spring-loaded floating drivers that center the tool accurately to follow the previously semi-reamed hole. These reamers have a full-length oil passage that permits cutting oil under pressure to flush away chips from the cutting area. Right-hand helical flutes start the chips in the proper direction to be removed by the oil. Smooth cutting action and fine finishes (20 to 25 mu in., rms) are aided by eight irregularly spaced flutes.

This operation is done on 1⅝-in. 8-spindle Cono-matic bar machines, whose last two positions handle rough and finish reaming. Worn finishing reamers do the roughing to 0.675 to 0.676 in., and new finishing tools start at 0.6852 to 0.6850. Final size of 0.6876 to 0.6881 in. is reached after heat-treat growth is removed by honing later.

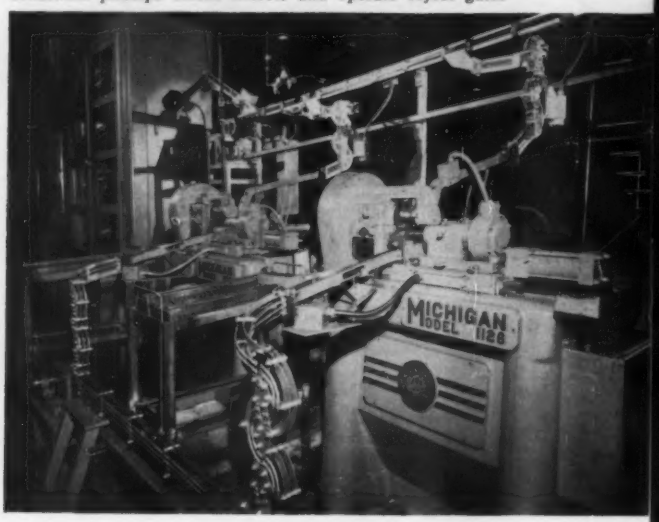
MORE SPECIAL POINTS

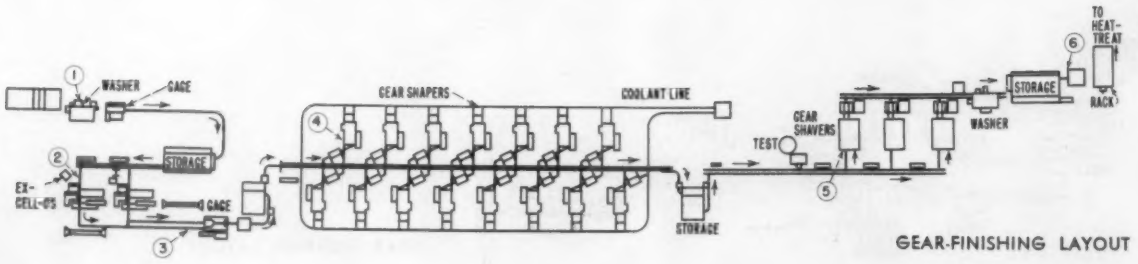
Tolerances on gear shaving are close, too. Size is held to 1.474 to 1.476 in., measured over 1.125-in.



9 — Gear faces are ground and lapped . . . square with the bores within 0.001 in. tir on Hoern & Dilts vertical machines. Each machine has a 4-station indexing table with double workholding fixtures, so eight gears are in process at all times. Loading mechanism also turns parts over 180°; so after one rotation on table when one gear side is ground and lapped, loader reverses part so other side is ground and lapped. Speed for each machine is 240 complete gears/hr (at 100%)

10 — 7-second sound test . . . shows up nicks or off-lead conditions with high-pitched vibration. Two Michigan Tool machines are fed gears after wash, blow-off, and gaging. When gears are spun with master gears, acoustical pickups detect defects and operate reject gates





GEAR-FINISHING LAYOUT

NEWS

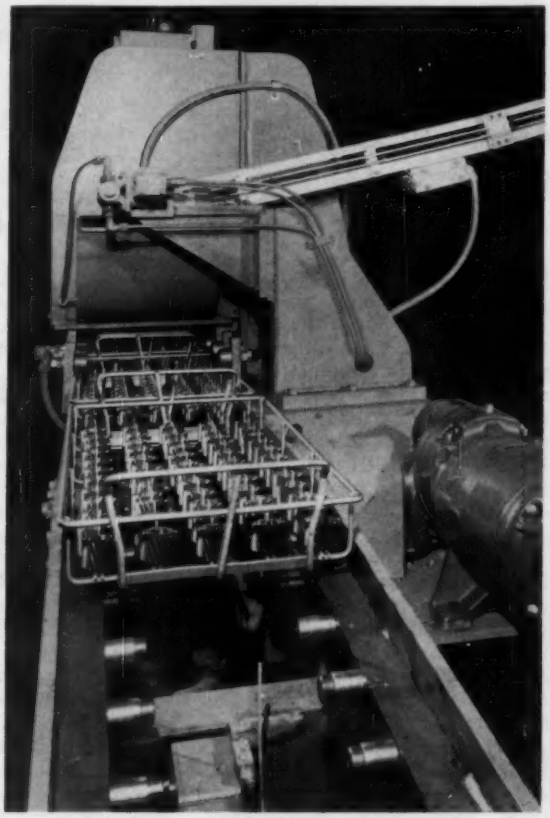
pins, and the finish must be 30 mu in. rms. Maximum PD runout is 0.002 in. tir, lead error may be only 0.0007 in., and accumulated tooth-spacing error cannot exceed 0.001 in. Involute profile error can be no more than 0.0005 in.

Heat-treating is the only spot where manual handling is required, except for salvage operations. The gears are heated to 1550 F in a Holcroft carbonitriding furnace with a salt-bath quench. Rockwell hardness of C 58 to 63 to a case depth of 0.005 to 0.012 in. results (Gear stock being treated is SAE 5140.)

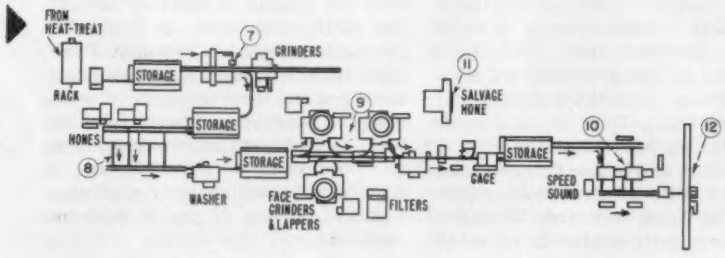
All through the line a number of "crippled" tracks are provided to lower the gears gently to conveyor or machine level. These units serve as a slowing device to prevent damage that would result from unrestricted gravity feed. See Fig. 9.

Final gaging, after face honing, only requires segregating out gears with defects of overall length and squareness, because those with errors in hole size were culled out at previous operations.

12 — 5-track loading head . . .
takes gears from power conveyor (from gear sound test) and places them on "Hairpin" vertical prongs in baskets. Gears load in 12 rows, five across. Inclined track removes baskets to monorail leading to transmission-assembly line

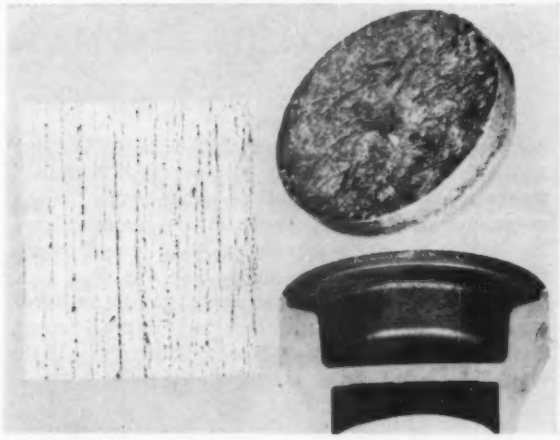


11 — Gear corrections are made . . .
on National Broach gear-honing machine. Processing takes about 25 seconds to eliminate nicks and digs and to make slight corrections in lead and profile. Repaired gears are tested by sound again

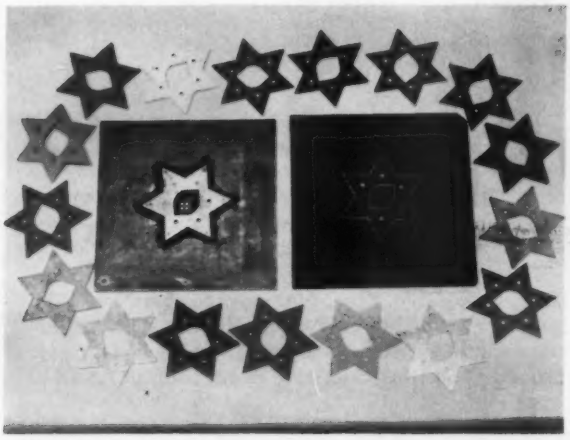


GEAR-FINISHING LAYOUT

NEWS REPORT



A new use for chips . . .
Crushed chips are compressed into blank slug (top right), also shown sectioned before machining (bottom right), heated and extruded to part shape. X100 photomicrograph (left) shows microstructure



"Cookie cutter" die . . .
shown here was made in one day by a man with no diemaking experience. All types of sheet, from thick paper to 3/16-in. steel can be blanked on this die without removal from the press

Compressed Chips and "Cookie Cutters"

–They May Play a Big Role in Future Auto Output

BUFFALO—Several examples of process improvements being developed through manufacturing research, including the direct conversion of chips to parts, were summarized by Glen R Fitzgerald at the National Production Meeting of SAE held here Mar 20 to 22. Mr Fitzgerald until recently headed the Process Development Staff at General Motors, is now chief engineer at AC Spark Plug.

Direct conversion of steel machining chips into parts now has great potential for material savings. Chips with 0.12 to 0.15% carbon have been used. Chips are crushed and broken into convenient sizes, washed, and cold compressed into a blank slug. The slugs are heated in an atmosphere furnace to 1500 F and extruded to part shape. Physical properties of such parts closely approach those made from mill-processed steel.

New Die Techniques

There was also much interest in the "cookie cutter" or "steel rule" process of making blanking dies. The die is made by bending steel rule to shape and mounting it in a plywood base. Space between the rule is filled with rubber. The punch is cut slightly oversize in a contour saw and shaved to size by the die.

The test die illustrated above was made in one day's time by a man with no previous diemaking experience. All types of material, ranging from 0.010-in. paper to 3/16-in. steel, were blanked in this die without removing it from the press.

A low-cost material for forming dies was reported by J C Holzwarth and S Menton of General Motors. This zinc-base material is called "Gmoodie," because it was developed for GM overseas operations, and is available from National Lead and Federated Metals Div. Composition is 4% Al, 3.25% Cu, 0.15% Mg, 0.80% Ni, 0.20% Ti, and the balance zinc.

In drawing, forming, flanging, and bending dies, this material can produce 5000 to 200,000 steel stampings, depending on the nature of the work. Cost of the material is up to twice that of conventional zinc-base die alloys, but more than 95% is recoverable on remelting.

"Gmoodie" will outwear conventional zinc-base tools by a ratio of about 4 to 1 when forming 18 to 20 gage cold-rolled steel. This ratio decreases as the severity of the draw increases or the thickness of the steel increases. Tools can be made for a fourth to a third the cost of ferrous dies and in less time. In some cases as little as five hours handwork has been required. Considerably more maintenance is required, however, than for ferrous tooling.

In a recent installation of several automatic machines at GM, one was equipped with a static circuit for comparison with the others using conventional controls.

The static circuit developed only two operational failures in 9 million cycles. Relays had to be replaced in the other machines after 3 million cycles. This development may solve the serious problem of trouble shooting and maintenance of electrical-control circuits.

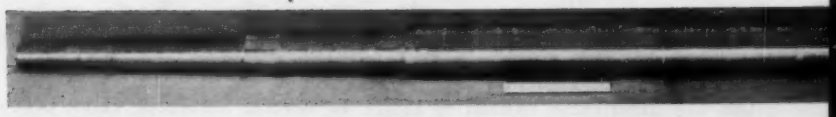
Used Tool Dealers Urged to Support Small Business Bill

WASHINGTON—The nation's used machine tool dealers are being asked by the Machinery Dealers' National Association to write their respective Senators urging support of Senate Bill S351, introduced by Sen John Sparkman (D, Ala) recently. Principal feature of the bill is a proposal to extend the same tax writeoff privileges to purchasers of used machine tools as to buyers of new machines, i.e., permission to write off, say, a $5500 used machine with a salvage value of $500 in 10 yearly $500 installments.

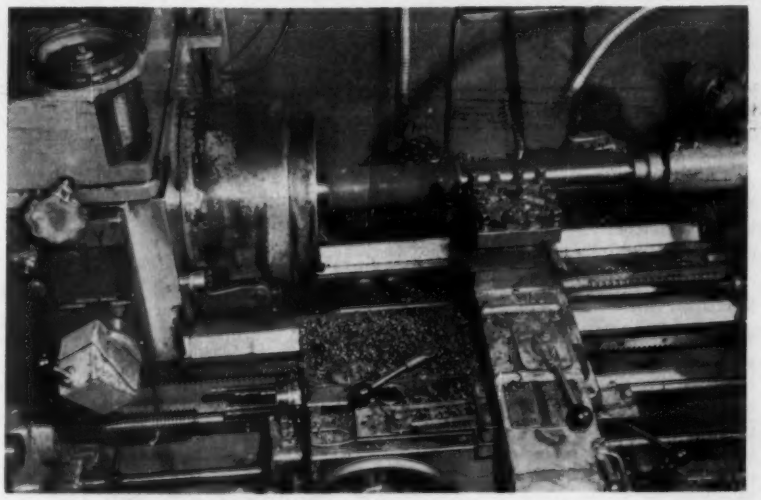
Are You Interested In Ceramics?

Latest group to give concentrated attention to the growing application of ceramic tools is ASTE. Twelve papers on ceramic tools were included in a symposium at the Silver Anniversary Meeting in Houston, Mar. 23 to 28. Principal conclusions of these papers are summarized here. Complete text of the symposium can be obtained for $6 from the ASTE, 10700 Puritan Ave, Detroit 38, Mich.

Two comprehensive reports on ceramic tools were published last year in *American Machinist*. Copies are available of Special Report No. 417, Tomorrow's Cutting Tools, 22 pages (25c), and Special Report No. 435, How Good Are Ceramic Tools?, 24 pages (35c). Copies can be obtained from Readers Service Department, *American Machinist*, 330 W. 42nd St, New York 36, NY. Copies are also available of a bibliography of articles on ceramic tools from *American Machinist*, starting with the first article published on the Russian work (*AM*—Nov 22 '54, p113).



Cam drum shaft made from A-4150 steel heat-treated to 269 to 302 Bhn



. . . was cut successfully with a ceramic tip . . .

¾ in. square and ¼ in. thick at 665 sfpm with a feed of 0.015 ipr and a cut depth of 0.120 in. Earlier attempts with a smaller tip and also with a higher speed were not successful. (Photos courtesy Warner & Swasey Co)

What's New in Ceramic Tooling?

HOUSTON—It took America's tool engineers two full days and well into the night of the second day to hear and hash over the latest and hottest developments in ceramic tooling in what is perhaps the most extensive and interesting symposium on the subject ever held by the metalworking industry. The scene was Houston's famous Hotel Shamrock; the dates March 25 and 26. The sponsor: American Society of Tool Engineers. Here are the highlights:

Reboring a Hard Die

• A round die-steel compacting die hardened to 64 R_c, with an ID of about 5 in., was rebored with a ceramic bit at 110 fpm, with 0.025 in. depth of cut, and 0.008 ipr feed. Results were excellent, as reported by Carborundum Co's Robert Rea, in terms of finish, accuracy, and time saved by comparison with the previous method of annealing the tube, reboring and rehardening it for grinding.

• Ceramic bits can be soft-soldered to tool shanks, and they can be attached to shanks with epoxy resins, Mr Rea also revealed. The tips to be soft-soldered must first be metallized by a proprietary process, and must be so specified when ordering them. The epoxy resin bonding, while still in early developmental stages, looks promising. The best adhesive tried so far is a mixture of rubber, asbestos, and an epoxy resin.

The Russians have apparently developed a method for brazing ceramic bits to steel shanks—but they're not using it, according to Nathan H Cook of MIT, reviewing published Russian technical works. And while the Russians to date have not reported using coolants with ceramic bits, some U S tests at MIT and elsewhere show that plain tap water will do the job if used right. In some recent tests at MIT, not specified as ceramic tests, it was found that excellent results were obtained when the coolant stream was directed so as to cool the surface of the workpiece on the opposite side from the turning tool. Thus the workpiece surface has time to get back to room temperature as it revolves toward the cutting tool.

• A research program conducted jointly over the past year by Warner & Swasey and Ohio State University was summarized by J D Moore and D R Kibbey. Tests were made on a Warner & Swasey No. 1A turret lathe modified for high-speed research. All tests were on SAE 1045 steel, normalized and annealed. Principal results:

1) Only 1% of the massive fractures occurred after the first ⅛ in. of feed.

2) On all tools tested *without* edge lands, 92% of failures were by flaking or fracture of the tool.

3) On all tools tested *with* edge lands, 76% of the failures were by flaking or fracture.

4) Life of ceramic tools is subject to wide variability at the present time.

5) Practical limit of speed on 1045 steel appears to be 2000 sfpm, although short cuts were made at speeds from 5000 to 16,000 sfpm.

6) Work finish was usually of the high quality previously reported with ceramic tools. An exception was when a wide edge land at 40° was

used—sometimes the chip welded back on the work surface, causing an extremely poor finish.

7) Normally the chip did not contact the chipbreaker (placed ⅛ in. behind the cutting edge). Edge lands had little effect on chip form.

8) Large radii and large edge lands were found to be desirable in rough cuts at 1000 sfpm. Feeds on these cuts ranged from 0.011 to 0.037 ipr and depth of cut from zero to 0.200 in.

9) For satisfactory tool life, an edge land is essential. Even the smallest land was more effective than the wide variation of other conditions tested.

Surface Finish

• The surface finish produced by either ceramic or carbide tools at high cutting speeds, where the built-up edge is small or nonexistent, is practically the same, according to research reported by Prof M S Shaw and Prof P A Smith of Massachusetts Institute of Technology.

While carbide tools are normally found to give a surface of maximum roughness at about 50 sfpm, ceramic tools continue to give surfaces of increasing roughness with decreasing speeds. Ceramics form a less stable built-up edge at low speeds than carbide tools. This fact plus the tendency of ceramics to be brittle at low temperatures (or speeds) means that ceramic tools chip badly when operated with a built-up edge at low speed.

Cutting forces seem to be similar for ceramics and carbides, with one sometimes lower and the other sometimes lower.

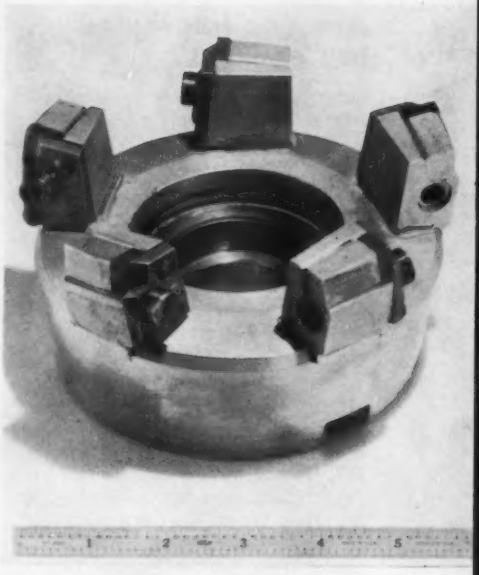
In several instances chips produced by ceramic tools are more ductile than those of carbide tools, suggesting that higher operating temperatures occur with ceramics than with carbides.

Carbide vs Ceramic Tool Heat

• Research to determine the comparative temperatures of cutting with ceramics and carbides has been sponsored by Warner & Swasey at MIT. Results were reported by Prof N H Cook. No method of direct measurement was found, so it was necessary to resort to analytic and comparative methods.

Analytic methods indicate that ceramic tools require slightly less power than an equivalent carbide tool and the chip-tool contact area is somewhat greater. However, the thermal conductivity of the ceramic is considerably less than that of metallic materials and this offsets the reduced energy input. The result is essentially equal cutting temperatures.

Experimentally, the chip-chipbreaker temperature is the same with either ceramic or carbide tools when cutting under identical conditions. This can be interpreted as an indication of equal cutting temperatures, but this is not proven. This is in contrast to the indication above that more ductile chips with ceramic tools suggest higher cutting temperatures.



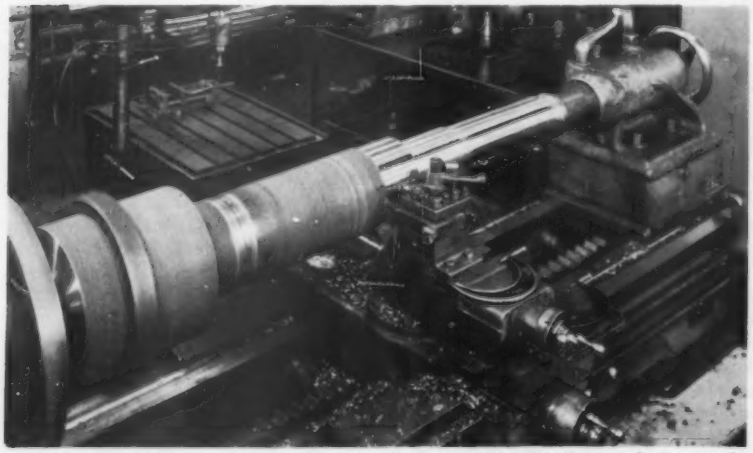
Face milling cutter . . .
for throwaway inserts tested on a new horizontal milling machine. Speeds were 880 to 1950 sfpm. It is believed that higher speeds plus negative land on the cutting edges may increase the potential of ceramic milling

This result is also in conflict with Russian data which shows consistently higher (about 30%) cutting tool temperatures for ceramic tools. This leaves the possibility that there is a difference between US and Soviet ceramic compositions. The Soviet data are based on tests made with a thermocouple junction placed near the top surface of the tool (with leads passing up through the tool). The Soviet method was among several methods tried at MIT and found to have severe practical limitations.

The method selected was to insulate the chipbreaker from the rest of the machine and to measure the thermoelectric electromotive force produced at the interface between the chip and chipbreaker.

Machining with Cemented Oxides

• General Electric's Metallurgical Products Division has obtained some good results with 0-30 cemented oxide bits in machining tough (100,000 to 280,000 psi tensile strength) steels at 500 to 1500 fpm and 0.002 to 0.020 ipr feed, with up to ⅛ depth of cut, 5° negative back and side rakes, and 5° clearance angles. Use of a water-soluble coolant is optional.



Photos courtesy The Warner & Swasey Co.

Rough-turned pentagon forging . . .
made from C-1050 steel is cut on a 2½-in. dia. at 710 sfpm with a feed of 0.015 ipr and depth of cut of 3/32 in.

Finish Turning with Ceramics

–Trial and Error, Then Success at W&S

HOUSTON—Ceramic tools have a definite place in finish turning operations, according to Alfred O Haeme and Robert T Hook of Warner & Swasey Co, reporting on laboratory research at that company since 1955. Other observations reported at ASTE's meeting here:

1) Ceramic tools can be successfully used on first and second operations on turret lathes.

2) Today's clamp-on tool holders are inadequate for ceramics.

3) Square tips work better than triangular tips.

4) Slug-type ceramics offer no advantages because of tendency to fracture badly during failure.

5) Coolants offer no apparent advantages or disadvantages.

6) U S-made ceramics vary widely in performance.

7) Speed ranges of 400 to 1000 sfm; feeds of 0.004 to 0.020 ipr; and depths of cuts from 0.010 to 0.375 are now practical.

8) Use of a negative land on the side cutting, 30° from the vertical of the workpiece—ground to a width representing about 80% of the feed rate, definitely improves tool life.

Face Milling Tests

Using a face milling cutter (6-in. OD, 30° lead angle, 7° negative axial and radial rake angles—with 14 clamped-in blades) on a new horizontal milling machine, Warner & Swasey's chief metallurgist R T Hook said the following cuts were made in ASTM A48 class 40 CI:

1) On a cut ⅛ in. deep at 326 rpm and 510 fpm and 10½ ipm feed (0.002-in. chip load per tooth) the finish showed heavy feed marks and indications of excessive pressure under cut.

2) Face of a cutter was reground to ⅛ in. flat—each blade with 5° clearance—using the same speed and depth of cut, with the feed stepped up to 21 ipm (0.0045 in. chip load per tooth). The finish showed improvement, but again the cutter showed excessive cutting pressure.

3) Depth of cut was reduced to 0.010 in., with speed at 326 rpm, 510 fpm and 21 ipm feed. The finish was a little better than the second cut, but pressure was still excessive.

In further tests, the speeds were gradually stepped up from 510 to 2000 fpm, with chip loads from 0.0005 to 0.002 in. per blade, and 0.010 in. depth of cut for finishing. It was found that as surface speed increased, better cutting action resulted in the higher ranges. In all these finish cuts, the cutter teeth were allowed to drag on back (cutter face was not inclined into cut) without apparent dulling of the cutting edges. Very light loads-per-tooth proved much better for ceramic milling than did heavier loads such as those used with carbides.

In essence, ceramic milling of cast iron has been sufficiently successful to justify further tests on straight cuts. Best speeds and feeds appear to be 2500 fpm and 0.001-in. chip-load-per-tooth. Accurately ground oxide inserts should be used. For roughing, a cut depth of ¼ in. or more can be tried. For finishing, a depth of 0.010 in. looks good. Apparently the same speeds and feeds can be used for roughing as for finishing.

Using the same cutter, W & S face-milled 3 in. wide bars of AISI A-4150 steel, heat-treated to 269-302 Bhn. Starting at 2500 fpm speed, 27 ipm feed (0.0013 in. chip-load-per-tooth) for roughing cuts ⅛ in. deep, and finishing cuts 0.010 in. deep, two pieces were milled with poor results. In a second trial, the oxide blades were indexed, the speed dropped to 1650 fpm and the feed to 22 ipm (0.0015 in. chip-load-per-tooth). Two pieces were again milled with poor results.

Then W & S ground a 3/64-in. flat with a 5° clearance angle on the face of the cutter, with a 7° clearance on OD to assure minimum run-out. Speed was cut to 900 fpm and feed to 15½ ipm (0.002 in. chip-load-per-tooth). The finish improved because the feed marks overlapped, and excellent cutting action was achieved on the first five pieces. Very little cutting pressure was noted. But on the sixth piece, finish was poor, and on the seventh worse still. The cutter showed 1/64 in. wear land on face edges, 1/32 in. wear land on OD edges, and four cracked blades. Total lineal inches cut in seven passes was 98 in. Thus at the moment, results of test milling steel with ceramics are poor.

By comparison, the same cutter setup with 14 precision-ground, hard, premium-grade cemented-carbide blades, was used to face mill the same steel parts at 900 fpm, 15½ ipm feed, ⅛ in. depth of cut for roughing, 0.010 in. depth of cut for finishing—and 40 pieces were milled to a better finish than that obtained with oxide blades. The cutter milled 672 lineal inches of 3-in.-wide stock, and the blades showed 1/64 in. wear land on the face edges.

The cutter was then put back without indexing the blades, the feed was increased to 40 ipm (0.005 in. chip-load-per-tooth) and the cutter milled 280 additional lineal inches of stock before showing 1/32 in. wear land on face edges.

At the moment, available hard carbides appear better than oxides for milling steel, but the results are still inconclusive.

A solid cemented-oxide fluted reamer has produced good experimental results when used in cast iron test blocks, but has achieved poor results when reaming steel blocks. For these tests, holes 0.309 in. in diameter were drilled through 1-in.-thick Class 30 cast iron blocks —and through blocks of C-1018 steel heated-treated to 170-180 Bhn. The reamer satisfactorily finished eight 0.309-in.-dia. holes in cast iron blocks to a specified 0.314 in. dia, with 60 mu-in. bore finished, without coolant. Cutting action was very free, and there was no noticeable release of pressure on the tool when the reamer broke through the other side.

Tests on Steel

The same reamer was tried on steel pieces, using sulphurized thread-cutting oil, but the same conditions otherwise. The reamer completed only one hole to the specified size and finish. Then it lost 0.003 in. on dia. after being used in five more test holes. All five holes were undersized, and the surfaces were rough, with noticeable score marks. All reaming of cast iron and steel was done at 1800 rpm in a bench drill press with "normal" hand feed. While reaming in steel to date is not successful, W & S continue its tests because of its success in reaming cast iron blocks.

NEWS REPORT

NEWS REPORT

Alloyed Resin Technique Improves Plastic Tools, Dies

HOUSTON—Versamid resins have been successfully applied in a drop-hammer die, checking fixtures, and chuck jaws where they modify the more common epoxy resins to allow better control over physical properties of the tooling plastics.

This development was reported March 23-28 by W Robert Price and D E Peerman, Chemical Div, General Mills, Inc, at the 25th Anniversary Meeting of ASTE. Advantages of this alloying technique are better control over flexibility of the drop-hammer punch, and high dimensional accuracy for the checking fixtures. Combining the two basic resins in the chuck jaws provided better hardness and grip in the chuck jaws, which were installed on Bore-Matics. Most of the best properties of both resins can be brought out with the alloying process, with most of the worst properties left behind.

Plastic Tool Limitations

Limitations of plastic tooling materials were covered by William Weaver, president, Modern Pattern & Plastics, Inc. These are important in tool planning because of the general lack of wide experience with plastic materials, as opposed to metals. For example, ironing and spanking with plastic dies are not good practices; flexibility of the plastic means it will deform behind a metal wrinkle—a problem even more serious with plastic dies than with steel. Burrs on metal blanks are dangerous to plastic dies, and dirt on the sheet metal may be picked up by the plastic material.

Mr Weaver also warned: Watch surface abrasion of the plastic when worked against cast metal surfaces; check structural rigidity of the base of plastic tools; see if normal shop abuse in foundries is too severe for plastic tools.

Advantages of Plastics

On the favorable side of plastics tooling, Lewis W Bogart, The Marblette Corp, noted that plastics have been applied to stretch forms, rubber press forms, drill fixtures, routing and trim fixtures, spinning forms, contour clamp pads, and study models. The last item is one in whose area considerable savings have been made. Low-cost models of plastic allow extensive production planning, which is more important nowdays than ever, especially in relation to mechanized handling through production.

On repair of plastic tools, Benjamin Sokol, Republic Aviation Corp, listed several types of failure and their probable causes during a panel discussion on plastic tools in service:

- Surface pitting—caused by air bubbles trapped in surface, moisture in plaster model against which plastic was formed.
- Surface crushing—caused by local high load, improper resin mixture, air trapped just below surface.
- Fractures—caused by poor design, overload, mishandling, mismatch in thermal coefficients of plastic and its support, poor weathering.
- Warpage—caused by creep, high temperature, overload, resin shrink.
- Loosening of inserts—caused by poor design or mounting, misuse of the component, accidental high impact.

Hughes Tool Co Official Elected ASTE President

HOUSTON—Harold E Collins, foreign operations manager for Houston's Hughes Tool Co and a director of Hughes, Belfast, Ireland, subsidiary, was elected 1957-58 president of the American Society of Tool Engineers at that Society's Silver Anniversary meeting here March 25.

The 1957-58 Slate

Named first vice president was George A. Goodwin, works manager, Master Electric Co, Dayton, Ohio; second vice president, Wayne Ewing, president, Arrowsmith Tool & Die Co, Los Angeles; third vice president, H Dale Long, president, Scully-Jones & Co, Chicago; fourth vice president, William Moreland, vice president, F E Myer & Bro Co Ashland, Ohio; secretary, David A Schrom, plant superintendent, York Corp, York, Pa; and treasurer, John A Ryneska, manager of purchasing, Lynn River Works, General Electric Co, Lynn, Mass.

B & S Expands "Precision Center"

SALESMEN FROM DISTRIBUTOR ORGANIZATIONS ARE THE STUDENTS at Brown & Sharpe's newly expanded "Precision Center" in Providence. The Center, the only one of its kind in the machine tool industry, teaches classes of from eight to thirty members such subjects as screw machine can and tool design, screw machine maintenance, and salesman training. The huge training and demonstration facility also has a lecture hall complete with revolving stage to demonstrate equipment. Here, students watch assembly of a spindle driving mechanism as part of the screw machine maintenance course

Foreign Aid Battle Looms

–Money Down the Drain, or Boon to US Manufacturing?

WASHINGTON—The quickening battle over budget cutting is sharpening the attack on a big federal spending program that means business for a big chunk of the metal working industry. It's labeled foreign aid.

Over the past few years, foreign aid has meant spending amounting from $2.7 billion to $4.7 billion per year—much of it for military end-items shipped to our allies overseas. (See table).

The balance of foreign aid spending goes for such things as economic development projects, which in a large measure also result in orders to U. S. firms for manufacturing, transportation and other kinds of industrial equipment.

Aid Here to Stay?

This year the battle could spell out whether foreign aid is here to stay as a more or less permanent slice of cream on top of the defense and export markets—or whether Congress will hack foreign aid spending as a step toward substantial cuts in the federal budget. The eventual hope is for a possible tax cut next year.

Foreign aid spending over a five year period—including the administration's request for the upcoming year—runs to some $18-$18.3 billion. Here's how the figures on shipments break down, in billions of dollars:

Fiscal Year	Economic	Military	Total
1954	$0.9	$3.8	$4.7
1955	1.3	1.5	2.8
1956	1.2	1.5	2.7
1957	1.1	2.6	3.7
1958*	1.4	2.9	4.4
Total	5.9	12.3	18.3

*Administration's budget request.

In the battle over the future of the program, here are some of the basic touch-points to consider:

•Shipments under the program have accounted for an average of 32.5% of total U. S. exports since 1948. And they added up to roughly 20% of all exports last year. (The chart above shows the effects on exports of selected individual industries.) In particular, aid has been a major channel for the export of surplus agricultural goods. Nearly $6 billion worth of surpluses has been exported under the program — not counting the nearly $3 billion sold under the Public Law 480 Surplus Disposal Program.

•Many of these additional export markets may become permanent as foreign buyers become used to U. S. products and dependent upon the U. S. for spare parts and replacements for equipment purchased under aid programs. This will be particularly true where whole plants, industrial complexes, or transportation and communications systems have been financed out of aid.

•Although this is an intangible factor it can be very important over the long haul: The British have managed to maintain a large slice of the markets of their former colonial dependencies—thanks largely to the fact that these countries were used to operating British equipment and conversion to other types was costly. Egypt has suffered severely since the start of the Suez crisis from the cutting off of imports from Britain—particularly of vitally needed railway equipment. One of the things that most alarms U. S. officials about the Russian economic offensive in underdeveloped countries is the possibility that through trade credits the Russians may win a permanent foothold in free world markets.

Improved Trade Climate

It seems certain that foreign aid has improved the general climate for U. S. foreign trade and investments. The dollar exchange provided has permitted foreign governments to resort less to discriminatory curbs on dollar imports and to cut-throat export subsidies designed to earn dollars. Economic recovery and expansion abroad, sparked by the foreign aid programs, in itself almost certainly has created larger markets for U. S. exports—because experience proves that our best customers are the more highly developed countries.

On the other side, there is no doubt that aid has built up some industries abroad which compete with our own at home and in third markets. But the foreign industries helped by the aid program had no more access to know how and capital than our own firms and hence no absolute advantage. On balance, U. S. industry has been able to hold its own against its foreign competitors, and the net increase in exports seems to heavily outweigh the losses due to sharper foreign competition.

The overseas sources of strategic

IMPACT OF AID PROGRAMS ON U S INDUSTRY

Industry	Aid shipments as percentage of total production	Aid shipments as percentage of total exports	Number of jobs created—directly or indirectly
Ordnance	9.4%	21.3%	13,100
Construction, mining & conveying equipment	15.4	76.8	23,400
Engines and turbines	3.0	22.0	3200
Tractors	5.9	20.9	6200
Aircraft engines, parts	8.8	70.3	72,900
Metalworking machinery	1.0	20.9	4700
Machine tools	1.5	20.7	2600
Electrical equipment	1.8	31.4	31,100
Generators, motors	1.6	31.4	2700
Industrial machinery	1.3	20.1	26,800
Agricultural machinery	1.8	16.5	2400
Motor vehicles	1.6	26.0	17,800
Other transport equipment	1.6	59.0	3900
Iron and steel products	0.6	17.7	66,400

Source: National Planning Association's report for the Senate Foreign Relations Committee, "The Foreign Aid Programs and the U S Economy."

NEWS REPORT

FOREIGN AID (continued)

materials which have been developed directly or indirectly under the aid program are of some importance in view of the increasing U. S. dependence upon foreign sources of key raw materials. About $250 million has been invested directly in dollars and local currency counterpart funds in foreign strategic materials production. Beyond that, long term procurement programs were initiated under the aid program which still are paying off.

Roughly 150 private American manufacturing and consulting firms, as well as universities and foundations, have been given contracts under the aid program for technical assistance abroad. Approximately one-third of these contracts have gone to private business firms. These contracts often lead to investments or exports for the U. S. firm.

At this stage, the avalanche of reports on foreign aid has compounded the existing confusion if anything. With the exception of the Fairless Report — which conservatively endorsed the main lines of the present program—most of the others agreed on a few basic reforms. They urged with varying degrees of insistence that there should be more economic development assistance for neutral countries, a clearer separation of military and economic aid, and that the administration should be given more discretion in spending the funds and in committing them over longer periods of time for long term development projects.

There is wide disagreement on other questions, however, such as whether there can or should be more loans and fewer grants, whether cuts are in order in the military program, whether more can be done to foster private investment abroad, whether more funds should be funneled through international agencies, how the administrative responsibility should be divided among various government agencies.

Precise prediction of the outcome of the great aid debate is impossible now. But two things are good bets. The present mood of Congress, combined with sharp differences of opinion on the future role of foreign aid within the administration itself, makes any dramatic changes in the aid program or any increases extremely unlikely this year. The big question is: can proponents fight off the growing drive to cut it back drastically?

"Re-Rated" Motors Accepted at JIC Electrical Standards Revision Meeting

DETROIT—The "re-rated" motor was accepted here March 20-22 as an industry-wide standard when 200 users and builders of industrial equipment met to revise JIC electrical standards. Other revisions adopted included limitations on wireways, new specifications for external controls, and for tables and diagrams relating to motor characteristics.

Purpose of the "re-rated" motor idea is to allow better-quality motors to be installed in smaller frames. Frame size under the old standard specified a motor of 1 hp larger than the motor rating recommended for the installation. The new standard calls for frame sizes capable of handling motors of 2 hp larger than the recommended size. This allows for increasing the power of the setup, and it permits use of 1940 NEMA-rating motors. Other revisions:

- All external controls for machine panels must be oil-tight, and breaking switches must be employed on both sides of solenoids.
- Push-to-test lights will be standard equipment, replacing the conventional warning lights that signal machine trouble. (There has always been a danger that the latter might be faulty and might fail to function as a warning. With the push-to-test light, a check can be made from time to time to make sure it's functioning properly.
- Wireways will be limited to the number of wires they can carry, with metal thickness at a minimum of 0.075 in. Number of wires used may not exceed 40% of the cross-sectional area fill.
- In addition to new electrical symbols, a number of diagrams and tables have been standardized.

Standards Are Voluntary

Although the revised standards became effective as of the final day of the Conference, these standards are voluntary and can be waived by the user. The document is not to be used as a substitute for knowledge. Rather, users are expected to use their discretion—employing JIC standards only to equipment that requires them.

Generally, it is expected that future purchase orders shall specify that equipment be built in accordance with JIC standards, but it must be emphasized that JIC standards and revisions cannot be adopted until the entire Conference is in complete accord, and that no deletions or changes can be made without Conference approval.

90% Agreement with NMTBA

Prior to this Conference, the most recent revisions of JIC electrical standards took place in March 1953. In January of the following year, the National Machine Tool Builders' Association issued a set of specifications that closely paralleled those adopted by JIC. The latest complete revisions of the NMTBA specifications were adopted in March 1956 and were taken into consideration during this JIC meeting. As a result, the revised JIC standards now include all existing data on the subject. It is interesting to note that NMTBA's specifications and the newly revised (as of March 1957) JIC standards are more than 90% in agreement.

Main purpose of the Conference, according to its chairman, John Q Holmes, director of production engineering, General Motors Technical Center, is to provide builders and users of industrial equipment with data on the best current practice for maximum personnel safey, uninterrupted production, long life of equipment, and reduced maintenance costs. It is not the intent of such conferences to discuss costs or products, nor are products approved or disapproved.

Moderators Appointed

To ensure avoidance of misunderstandings or misinterpretations relative to reasons for additions and revisions, or for not adopting changes, three Conference moderators were selected because of long familiarity with the technology of machine electrification: John Stewart of Chrysler Corp, R W Kowitz of Ford, and J J Yates of GM's Detroit Diesel Division. Conference secretary was Robert R Mitchell of General Motors Technical Center.

A nominal charge for copies of the revised standards will be made when they are published. They will be available from Joint Industry Conference, Box 128 (formerly Box 182) Detroit 2.

NEWS REPORT

Materials on the March

LOS ANGELES—"Present conventional techniques would not suffice if the demand for machined components were multiplied for mobilization by approximately 50, and the number of machine tools remained constant or nearly so." In those words, spoken before one of the ASM meetings at the 10th Western Metal Congress here, North American Aviation's Kenneth L Wilson pretty well summed up the metallurgical and metalworking problems of today and tomorrow.

These basic problems affect the long-range outlook—even the day-to-day work—of every member of the five major sponsoring societies of the Congress: American Society for Metals, American Welding Society, Society for Non-Destructive Testing, Society of the Plastics Industries, and American Institute of Mining, Metallurgical and Petroleum Engineers' Metals Branch.

Highlights of the concurrent five-day five-society technical programs, held March 25-29, included:

• Development of iron-chromium-manganese superalloys for service in the temperature range 1000-1500 F provide a considerable saving in strategic materials and costs with little or no sacrifice in properties—*E E Reynolds, associate director of research, and R K Pitler, supervising metallurgist for high-temperature alloys, Allegheny Ludlum Steel Corp,* told AIMMPE.

• ". . . the strongest aluminum alloys, such as 7075 and 2014, are being cold-extruded in lengths up to 60 ft, diameters up to 8 in., and with both internal and external configurations as an integral part of the tubular structures . . . Work also is being done on low and medium carbon steels, and is being initiated on stainless steel for simple shapes"—*Raymond A Quadt, VP and director of research, Hunter-Douglas Aluminum Corp,* ASM.

• Setup for radiographic examination of multi-thickness specimens is speeded, as well as limited to one exposure, by a multiple-film technique utilizing two or more films of different radiographic speeds. Slower film records thin sections, while faster film or films record thicker sections—*Ralph E Turner, Eastman Kodak Co,* SNT.

• Phosphorus, although with spec for aircraft-quality steel, is responsible for low ductility and subsequent cracking of welds at temperatures just below the solidus or melting point. Ductility and fracture strength of SAE 4340 steel containing 0.039% phosphorus is greatly reduced in the temperature range 2300 to 2600 F. In the same range, steels containing 0.004 and 0.017% phosphorus showed much better properties—*Glenn E Faulkner, assistant chief, metals joining division, Battelle Memorial Institute,* told AWS.

• "Research sponsored by the Office of Naval Research has resulted in development of molybdenum-base alloys with higher useful strength at temperatures over 1600 F than any other presently known materials. The alloy containing 0.5% titanium has the best high-temperature properties of the available molybdenum-base alloys . . . Coatings developed to protect moly against oxidation permit a useful life of several hundred hours at temperatures up to at least 2000 F under certain conditions . . . Arc-welded joints with some ductility have been produced under optimum conditions"—*Robert R Freeman, manager arc-cast molybdenum development, Climax Molybdenum Co,* told AIMMPE.

• Salvaging of aircraft parts which otherwise would be scrapped because their mechanical properties could not be determined without destructive tests is now accomplished through a series of hardness-tensile tests, carried far below specification minimums, to evaluate the parts' mechanical properties. Tests are given primarily to parts suspected of being improperly processed. The suspected discrepancy must be known to evaluate mechanical properties from hardness tests—*R E Kleint and G E Mathers, research engineers, North American Aviation Inc,* told AIMMPE.

• Specimens are heated at 3000 F per second to provide information necessary for rocket design—*Warner T Smith, head, metallurgy section, Materials Evaluation Branch, U S Naval Ordnance Test Station, China Lake, Calif,* told ASM.

(Continued on next page)

Heaviest Single Machinery Shipment?

This 750,000-lb steam drop-forge hammer took three freight cars to ship it from Strom Machinery Corp, Hammond, Ind, and Samson Machinery Co, Chicago, to New Orleans, where it was transferred aboard the Fabre Steamship Line for export to a French firm. Illinois Central RR carried the 500,000-lb base and subbase in a 250-ton capacity flatcar equipped with a heavy-duty underframe and 24 wheels. Balance of the equipment was moved in a conventional flatcar and a standard gondola car

NEWS REPORT

Materials (continued)

• Radioactive gas named "Radene" in a test called "Radioflo" is used to determine the quality of hermetic sealing for electronic parts, magnetrons, vacuum tubes, small fuel tanks and other housings. Absorption of radioactive molecules is measured with standard instruments—*Theodore J Smith, chief applications engineer, Reed-Curtis Nuclear Industries*, told SNT.

• "Roll planishing" takes the place of weld peening or hammer planishing to provide continuous uniform cold working which significantly improves tensile strength and ductility on welded joints—*Harlan L Meredith, VP, Airline Welding & Engineering Co*, AWS.

• "Quantitative damage to tensile properties of 195-T6 aluminum alloy containing elongated gas porosity is linear with respect to intensity of the radiographic appearance of this defect. Depending upon the severity of the defect, the reduction in tensile properties ranges up to 67% elongation, 29% tensile strength, and only 9% in yield strength"—*Irving J Feinberg, supervisory ordnance engineer, U S Naval Ordnance Laboratory, Silver Springs, Md*—SNT.

• "Stress relief by compressive deformation, where it is applicable and properly done, will compare favorably to stress relief (in other alloys) by stretching. Many large aluminum forgings, plates and extrusions do not lend themselves to currently practiced methods of stress relief. Compressive deformation of aluminum alloys after heat treatment will accomplish significant stress relief"—*R E Kleint, research engineer, and F G Janney, test engineer, production development North American Aviation Inc*—AIMMPE.

Lamb Waves Detect Flaws

• "Lamb waves, projected by an ultrasonic beam to detect and measure flaws in and under surfaces of metal parts, are used in thin sheets, flat plates, and cylindrical surfaces. Different Lamb-wave modes are developed in inspected work as the incident angle of the supersonic beam is varied. Flaws positioned within 0.003 in. of the surface were revealed using Lamb waves at frequencies of 2.25, 5 and 10 megacycles . . . In this method, front surface echo is eliminated from the receiver output, hence shallow flaws can be detected with interrogating pulses of long duration"—*D C Worthen, electrical engineer, General Electric Co*—SNT.

• "Tests have shown that pure titanium and alloys containing primarily alpha-stabilizing elements have very good as-welded properties. Welded joints of these materials are not adversely affected by aging at elevated temperatures. But alloys containing primarily beta stabilizing elements have moderately good as-welded properties, while aging at elevated temperatures has an extremely adverse brittling effect on the weld joints"—*Russ Meredith, welding group leader, North American Aviation Inc*—ASM.

Ceramic Lubricants

• "Resistance heating and ceramic lubricants are used successfully in hot-forming 6A1-4V titanium alloy sheet. During solution heat treatment in conventional furnaces, protective coatings minimize oxygen contamination. Straightening is done during the aging cycle"—*J Fred Baisch, Pilotless Aircraft, Boeing Airplane Co*—AIMMPE.

Paper Honeycomb Core

• A 3-in.-thick paper-honeycomb core having inner and outer skins of reinforced plastic, all 100% waterproof, is used for the hull of a 36-ft landing craft built for the U S Navy. Honeycomb is fabricated from a laminate consisting of a 15-mil core of polyethylene film between two layers of brown Kraft paper—*John Margicola, Zenith Plastics Co*—SPI.

Reinforced Plastics for Rockets

• Reinforced plastics have found many applications in the rocket industry, broadly classified into primary and secondary structures. Typical primary structures are pressure vessels, including rocket chambers, warheads, wave shapers, tankage, jet vanes, nozzles and miscellaneous hardware. Secondary structures include various forms of thermal insulation, restrictions and supports for propellants, deflectors and cones, extension tubes, resonance rods, and containers for pyrotechnic mixtures. Service requirements range from short-time temperatures higher than 1000 F to temperatures as low as –300 F. Glass-filament-wound pressure vessels from 1½ in. to 24 in. OD provide burst-pressure strength from 1000 to 10,000 psi. Thin wall, mild steel structures are reinforced with plastics to permit long-duration firing. SPI.

Diamond Tooling Gets a Lift At New Eastern Plant

PEEKSKILL, N Y—U S metalworking and the automotive maintenance industry in particular stand to benefit from new diamond tool manufacturing techniques unveiled at the opening of National Diamond Laboratory's new plant here. New equipment and methods designed to supply metalworking with more and better precision tools include high-voltage lapping of industrial diamonds using a technique developed by the U S Bureau of Standards, high-frequency brazing equipment for tools not adaptable to powder metallurgy setting of diamonds, supersonic cleaning equipment, and unusual inspection equipment.

New Inspection Tools

The latter category includes a toolmaker's microscope with graduated reticules for determining correct form and centering of the diamond in dressers for thread-grinding wheels. A new type of powder-metal setting has been developed to accommodate the diamond (a large one is preferable) in the confined space available. The diamond is set central within 0.0005 to 0.0015 in., and the nose radius does not exceed 0.003 in.

Square Toolbits

Diamond sawing equipment has been devised to make square toolbits with radiused corners and proper cutting clearance. These toolbits are clamped in a holder to bore out carbide rings, worn drawing dies, carbide bushings, or holes in carbide or hardened steel, thereby saving lapping time.

Minute diamond quills are made to grind holes as small as 0.033 in. dia. Finally, a technique has been devised to put an accurate radius of 0.0005 in. on a diamond.

National Diamond has also worked out several innovations in the 5000-sq-ft plant, including contour projectors that show the form of the diamond wheel as it is worked on, particularly after it has been put into a setting and is being machined. The new National Diamond Laboratory is the successor to National Diamond Hone & Wheel Co of New York City.

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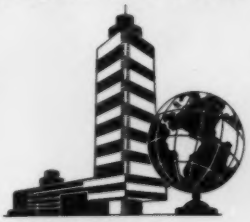

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MACHINES AND ATTACHMENTS

1 MILLING MACHINES—*Van Norman Machine Co, Springfield 7, Mass.* 12-page catalog pictures and describes new line of ram-type units with adjustable cutterhead as standard equipment; this permits horizontal, vertical, and angular milling without attachments.

2 CENTERLESS LAPPING MACHINES—*Cincinnati Grinders Inc, Cincinnati 9, Ohio.* 12-page catalog G-653 contains illustrated information on Filmatic unit for improving accuracy and finish of thrufeed centerless ground parts. Finishes within 1 to 2 mu-in. can be obtained, and diameter tolerances of 0.00005 to 0.000025 in. Design and construction features, specifications, standard and optional equipment covered.

3 VERTICAL TWIN-RAM BROACHING MACHINE—*Detroit Broach & Machine Co, Rochester, Mich.* 8-page illustrated brochure gives data on units available in capacities from 5 to 25 tons, stroke lengths from 30 to 100 in., cutting speeds between 4 and 35 fpm. Installation and specification data included.

● TURRET DRILLING — *Howe & Fant, 20 Fitch St, East Norwalk, Conn.* 20-page brochure, "Drama in Drilling," describes principles and technique. Illustrated applications discussed include consecutive operations in a single hole location, straight line hole patterns, single and concentric bolt circles, and random hole patterns in one plane and in many different planes. Request direct on company letterhead.

4 CHICAGO PRESS BRAKES—*Dreis & Krump Manufacturing Co, 7400 S Loomis Blvd, Chicago 36, Ill.* 4-page bulletin 57PR contains information on Series D heavy-duty steel press brakes. Describes features, gives specifications and capacities of 40 standard sizes.

5 PLATE AND SHEET METAL-WORKING MACHINES—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, N.Y.* 40-page pocket-size booklet 203 summarizes data on power-operated units in each series in the line. Tabulated specification charts on all principal models.

6 HORIZONTAL REDRAW PRESSES —*Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 12-page illustrated brochure 926-M-4 describes line of horizontal, multi-station, automatic units for quantity production of straight and shouldered deep shells in variety of sizes and shapes. Covers 13 machines with production rates to 100 shells per minute.

7 SLICING AND DICING MACHINE —*DoAll Co, Des Plaines, Ill.* 4-page bulletin illustrates applications and gives data on the Microtomatic, an automatic unit for machining of brittle, shock-sensitive materials such as germanium, silicon, quartz, ceramics, and carbides. Specifications given for three sizes of machines.

8 SCREW AND RIVET HEADERS—*Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 4-page circular 782-A-4 describes the 3/16 and 5/16-in Hi-Pro solid-die, double-stroke units for cold heading. Respective production rates are 225 and 175 screw or rivet blanks per minute; max lengths, 1½ and 2⅝ in.

TOOLS AND ACCESSORIES

9 STAGING FIXTURE—*Optical Gaging Products, 85 Forbes St, Rochester 11, N.Y.* 8-page booklet contains facts on OGP Multi-Use stage. Illustrates how various holders can be used to stage a variety of parts on all makes of optical comparators. Includes dimensions of standard part holders and end stops available.

10 TURRET TOOLPOSTS — *McCrosky Tool Corp, Meadville, Penna.* 8-page bulletin 19-T presents illustrated data on toolposts with clamping handle for positive locking and to withstand vibration on heavy-duty production lathes. Three styles (11 sizes) mount in T-slot of the compound rest or bolt circle of the main slide.

11 HACKSAWS AND BANDSAWS — *Henry Disston Division, H K Porter Co, Philadelphia 35, Penna.* 8-page folder gives specifications on machine and hand blades, lists material cutting recommendations from aluminum to structural steel.

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Folder available on bandsaw blades for ferrous and non-ferrous metals, plastics, wood, and pulp materials lists latest machine specifications for proper selection.

12 ENGRAVERS AND ACCESSORIES —*Mico Instrument Co, 80 Trowbridge St, Cambridge 38, Mass.* 14-page catalog 57 illustrates and describes line of pantograph machines and accessory items. Data included on company's cutter grinder, nameplate edging machine, drillpress, and hand tapping unit.

13 PORTABLE TOOLS—*Precise Products Corp, Racine, Wis.* 28-page illustrated catalog FGH-3 covers grinder millers, power quills (new Super 80, a 1½-hp tool has speeds from 7000 to 25,000 rpm). Data also on milling machines, accessories, speed lathes, mounts, filtration units.

14 HIGH-SPEED DRILLS — *Hi-Duty Drill Works, Fleetwood, Penna.* Illustrated catalog covers line of flat twisted and rolled section high-speed drills; lists diameters, lengths, applications of sizes from ½ to 3½ in.

15 WORK POSITIONERS — *Lowerator Division, American Machine & Foundry Co, 261 Madison Ave, New York 16, N.Y.* 6-page folder illustrates and describes types and models of self-leveling Lowerator units for material positioning and handling. Top layer of material is always maintained at best working or dispensing level whether unit is full, half full, or nearly empty.

16 PRODUCTION MARKING MACHINES—*Jas H Matthews & Co, 3943 Forbes St, Pittsburgh 13, Penna.* Illustrated leaflets describe features, give specifications for No. 201 rotary table unit, No. 79 shell marking and knurling machine, and No. 222 model for nameplates.

HEAT TREATING AND WELDING

17 ELECTRIC HEATERS AND HEATING DEVICES — *General Electric Co, Schenectady 6, N.Y.* 72-page catalog GEC-1005H gives data, specifications, operating information, list prices of standard units. Includes immersion, strip, cartridge, tubular, finned tubular, and railroad switch heaters; unit heaters, soldering irons, soft metal melting pots, oven equipment and controls.

18 WELDING CHART—*Hobart Brothers Co, Hobart Square, Troy, Ohio.* Wall chart (EW-198) for arc welding lists and gives instructions on use of electrodes including carbon and low alloy steel, iron powder, hardfacing and buildup, cast iron, non-ferrous, and stainless. Covers procedure, types of joints, typical positions, causes of troubles, and solutions.

19 FURNACE BRAZING — *Fabriform Metal Products, Div of George Getz Corp, 7720 Maie Ave, Los Angeles 1, Calif.* Illustrated data folder explains available processes, describes their particular features. Covers materials to use, size limitation of parts, design, and finish. Equipment description included.

PARTS AND MATERIALS

● STEEL PRODUCTS—*Crucible Steel Co of America, Engineering Service Dept, Box 1558, Pittsburgh 30, Penna.* 232-page catalog describes over 700 products available from stock. Index lists 16 categories of special purpose steels, including HSS, tool, stainless, alloy and machinery furnished in 16,000 grades and sizes. Includes estimating, conversions and weight tables. Request direct on company letterhead.

20 SINGLE-PHASE CAPACITOR MOTORS—*General Electric Co, Schenectady 5, N.Y.* 8-page booklet GEA-6240A illustrates and describes design advantages of Tri/Clad 55 motors, 1-3 hp, 115/230 v, 60 c. Dimension data for estimating is given on drip-proof, resilient-base, and totally enclosed fan-cooled units. Rating and type charts included.

21 SINTERED POWDER METAL PRODUCTS — *Bunting Brass & Bronze Co, 719-755 Spencer St, Toledo 1, Ohio.* 24-page illustrated engineering handbook contains data on bearings, machine parts, infiltrated and plated parts, and pole pieces. Covers secondary machining operations, supplemental lubrication, tools for machining, dimensional tolerances, PV chart with instructions for use.

22 MAGNETIC DRIVES — *Whitney Chain Co, 837 Hamilton St, Hartford 2, Conn.* 6-page bulletin W-T 1-57 describes features of self-contained permanent-magnet Tormag units ranging from 1 to 15 hp. Applications and installations illustrated, operating and performance curves, output torque rating-dimensions, selection chart included.

23 "FATIGUE-PROOF" STEEL BARS *LaSalle Steel Co, PO Box 6500-A Chicago 80, Ill.* 24-page illustrated bulletin gives details on bars made by elevated temperature drawing, resulting in high strength without heat treating, uniformity, machinability. Specifications, charts; typical parts produced are discussed.

24 FITTING FOR BEARING LUBRICATION—*Keystone Lubricating Co, 3100 North 31st St, Philadelphia 32, Penna.* 4-page bulletin BU-61 gives illustrated data on RT (relief-type) fitting for easy attachment to bearing housings of motors, machines, or pillow blocks equipped with conventional relief plugs.

25 STEEL BARS—*Republic Steel Corp, 3100 E 45th St, Cleveland 27, Ohio.* 4-page folder ADV-746 describes new Die-Form process for cold reduction of bars into multi-diameter shaft blanks ready for finish turning or grinding.

26 ROLLER GEAR DRIVES—*Ferguson Machine Corp of Indiana, Roller Gear Div, PO Box 5841, St Louis 31, Mo.* 4-page bulletin 107A describes new line of small E Series for precision indexing of machines and instruments with low torque requirements and need for 2000 indexes per min. Load ratings and dimensions given for 19 standard units with from 3 to 12 stops, and indexing periods of 120, 180, and 270°.

27 SILICONE FLUIDS—*Dow Corning Corp, Midland, Mich.* 4-page reference brochure 3-106 describes physical and electrical characteristics of all leading silicone fluids commercially available. Data in tabular form covers standard properties; brief description of each fluid provided, with general application.

S J Hunt, director of research and development for National Automatic Tool Co, has been appointed vice president, engineering

Donald C Campbell has been named works manager of Skinner Chuck Co. Prior to joining the firm he held a similar post at Whirlpool-Seeger Corp

H Pelphrey, chief research engineer at Michigan Tool Co, has been named director of engineering research to work mainly in the gear development field

Names in the News . . .

F S Van Valkenburg has been elected board chairman of Waterbury Farrel Foundry & Machine Co. Additional elections: **A D Mitchell,** president; **R C Bannon** and **Tadeusz Sendzimir,** vice presidents. Mr Sendzimir will continue to manage the recently acquired Sendzimir Cold Rolling Mill Division.

Roger H Brown has been appointed sales manager of the Industrial Division of Warner Electric Brake & Clutch Co, Beloit, Wis. He was formerly regional sales manager of the company's eastern division.

John H Biggs has been made New York district sales manager for the Machine Tool Division of Brown & Sharpe Mfg Co, Providence, RI. **Robert E Berger** has been named district sales manager for the company's Industrial Products Division.

J Leslie Lenton has been appointed general manager of the Richmond machining plant of Kaiser Aircraft & Electronics Corp, Oakland, Calif. He was formerly vice president and general manager of Aero Supply Manufacturing Co, Corry, Penna.

Cecil Kazmaier, general manager of Cross Manufacturing Co, Lewis, Kansas, has been assigned to head the newly established industrial hydraulics division.

Robert H Geiss and **H Eugene Fielder** have been appointed joint supervisors of the new Wire Machinery Division of Kurt Orban Co, Jersey City, NJ. Division will handle sales of Herborn wire drawing machines and auxiliary equipment, and Wafios wire forming and weaving machines. Orban has been US distributor for this German equipment since 1949.

Charles Linduska has been appointed staff assistant to the executive vice president and general manager of Clearing Machine Corp. He moves up from the post of assistant sales manager in charge of sales estimating. **David W Bonnar,** formerly sales director of the company's small press line, has been assigned to the Detroit office as senior sales engineer on major accounts.

Bruce L Sutton has been named sales manager of the Tatnall Measuring Systems Co, Phoenixville, Penna. He was formerly sales manager of Gilmore Industries.

Bernard Levine has been appointed a vice president of Norden-Ketay Corp, Stamford, Conn. He will continue to serve as general manager of the Precision Components Division.

Claude R Morgan, associated with Cone Automatic Machine Co, Windsor, Vt, as consulting engineer on carbide tool development, is now operating from his Pittsfield, Mass, home in an advisory capacity on high speed and carbide tooling.

Thomas M Ryan has been named vice president and general manager of Press Automation Systems, Inc. He was formerly manager of Sahlin Engineering Co

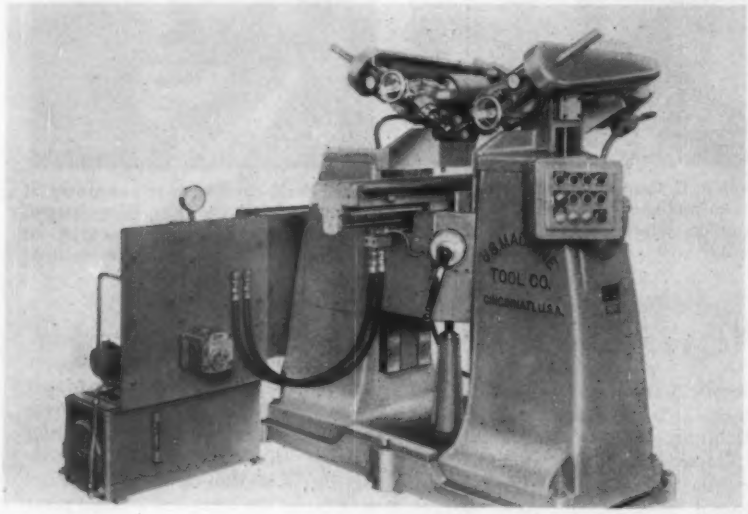
Fritz Walters, head of service operations for Detroit Tap & Tool Co, has been appointed sales and service manager

OBITUARIES

William LaCoste Neilson, vice president and former director of Norton Co, died March 5. One of the company's first two vice presidents elected in 1919, he either helped establish or manage nearly all of Norton's plants in Australia, Canada, England, France, Germany, and Italy.

Donald E Van Deusen, 60, former president of the Kelly Reamer Co, Cleveland, died March 7. Mr Van Deusen headed the company from 1937 until it was sold a year ago.

New Shop Equipment



Double-Column Hydraulic Miller Accepts Variety of Heads

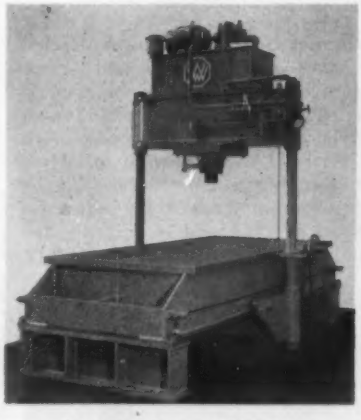
Unit construction of Hy-Flex production milling machine permits mounting of any type heads in the required position for milling, drilling, grinding, boring or special applications. Column tops are finished machined, approx 12½ in. square, providing adequate mounting surface for many combinations of heads. Illustration shows machine with two independent milling heads with 5½ in. of quill travel. Machine may be operated with heads leading or opposed to each other—in line with, tilted above or below the horizontal plane.

Also available is a vertically mounted 7½-hp, No. 50 taper, 1800-rpm milling spindle secured to a bridge based on both columns. Unit may also be fitted with four independently motorized grinder spindles.

The base is available separately, if desired, with full hydraulic longitudinal table feed.

Table has 30-in.-max stroke, adjusted by movable dogs; infinitely adjustable feed rate; forward and return jog; and automatic or semi-automatic cycling of rapid traverse, feed, return and stop.

U S Burke Machine Tool Div, 6 Brotherton Rd, Cincinnati 27, Ohio



Traveling-Head Straightening Press Has 75-Ton Capacity

Straightening press has a table area of 124 x 60 in., 26 in. of daylight over table, and a stroke of 14 in. Gantry travel of 100 in. is controlled by handwheel. Ram has an advance speed of 42 ipm, 5½ ipm at full pressure, a return speed of 78 ipm.

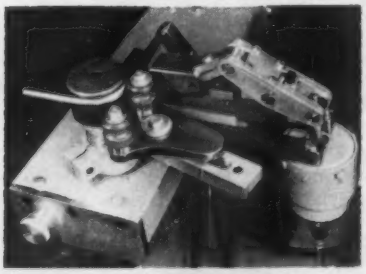
Control of ram is by hand lever mounted on gantry, and moving lever down causes ram to descend in rapid traverse, speed until it contacts work. Ram then moves at full pressure speed until preset or capacity resistance is reached. Releasing hand lever halts travel of ram. Lever must be moved in opposite direction to return ram to up position.

Williams-White & Co, 801 Third Ave, Moline, Ill

High-Temperature Nickel Alloy Operates at 1400 F

Trademarked Incoloy T, a high-temperature nickel alloy has been developed for possible use in highly stressed parts of jet-engine combustion systems. The nickel-iron-chromium alloy, which also contains titanium, is produced as a sheet material designed to operate at temperatures up to 1400 F, and in some applications even higher. It is similar in composition to company's Incoloy nickel-iron-chromium alloy and contains, in addition, about 1% titanium.

International Nickel Co, Inc, 67 Wall St, New York 5, NY



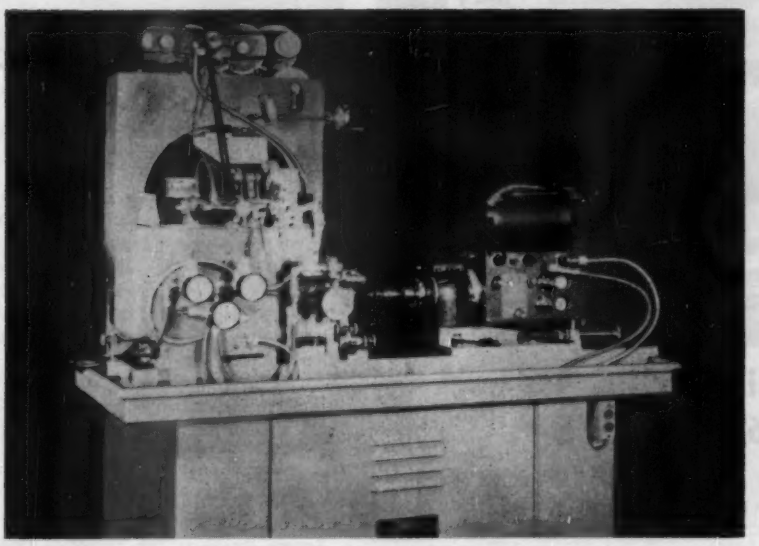
Power Bending Machine Operated by Foot Control

Model 410 Curvit is designed for bending tubing through ⅝-in. dia and steel rods through 5/16-in. dia, using minimum amount of air. Material is both clamped and formed by power; one foot control operates entire clamping and bending sequence.

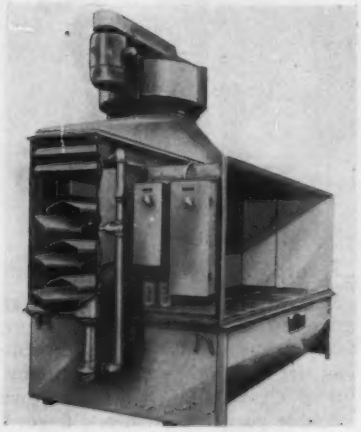
The 3-ft-long unit incorporates features of larger Curvit machines including either a 4-place turret stop or a fast-operating adjustable stop. It is equipped with air cleaner, lubricator, and sealed ball bearings.

Kilham Engineering Inc, Box 208 RFD, North Attleboro, Mass

Materials and Parts . . .



LONG RIVETS, ELECTRICAL TERMINALS, and other headed parts are drilled and tapped on this Model 408 Beco automatic drill and tapping machine. Equipped with long-shank hopper feeder, unit will accommodate shank lengths from ⅜ to 3¾ in. and shank dia from 0.090 to 0.375 in. Automatic self-reversing tapping attachments are used for tapping. Machine operates by electric-solenoid-valve-controlled compressed air on 65-100 psi air line pressure at approx 400 strokes per cu ft of free air. Production rate is approx 30 pieces per min for steel parts drilled 7/16 in. deep, approx 60 per min in non-ferrous metals. Tapping production is approx 45 pieces per min in steel—*Batchelder Engineering Co, Inc, 125 Main St, Springfield, Vt*



Fumes, Dust, and Particles Are Removed in Wet-Type Bench Grinder

Wet-type ventilated grinding bench is designed to improve efficiency in grinding operations through removal of abrasive fumes, dust, and particles especially where aluminum-magnesium metals are being used. Bench has tank for re-circulating water and sludge disposal, re-circulating pump, exhaust fan, hardwood grating work surface, and an air-washing chamber. Water curtains within washing chamber trap dust particles as they are drawn up by exhaust fan, and wash them down to settling tank. Fumes are removed same way.

Magnesium in presence of water liberates hydrogen gas which in certain concentrations becomes dangerous. Use of a high flash point mineral oil eliminates this problem by coating particles and metallic dust with oil.

Disposal can be performed manually or by means of a sludge conveyor which can be furnished with unit.

Machinery and Equipment Div, Zack Co, 12600 Beech Rd, Detroit 39, Mich

...including

MACHINE TOOLS AND ATTACHMENTS

Radial Drillpress 172
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Hydraulic Borer 176
Honing Machine 182

TOOLS AND ACCESSORIES

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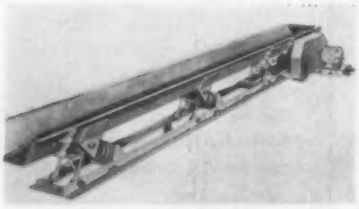
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

Walker-Turner Radial Drillpress Drills to Center of 62-in. Circle

Available in 24 models with either 4¼- or 6-in. spindle travel and standard 30-in. or long 42-in. column length, the Walker-Turner radial drillpress is said to make it unnecessary to move dies or other mounting fixtures. Head moves in and out through an 18-in. travel radius on a traveling ram that permits drilling to center of a 62-in. circle. Head, ram, and cradle swivel 360° around the column to permit drilling anywhere on table. Head can be raised and lowered rapidly and tilts 45°.

Built-in ball-bearing jackshaft assembly provides 15 full-power speeds ranging from 160 to 8300 rpm with a 1740 rpm motor. Standard drillpress attachments can be used with machine. Prices range from $695 to $750 without motor or base.

Walker-Turner Div, Rockwell Mfg Co, 400 N Lexington Ave, Pittsburgh 8, Penna

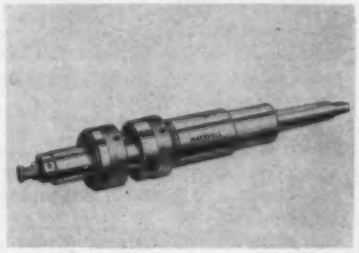


Link-Belt Oscillating Conveyor Handles Bulk Materials

Designated Coilmount, oscillating conveyor line for bulk materials handling is engineered for applications in the intermediate ranges and capacities. Line augments company's previously announced Flexmount (for light duty) and Torqmount (for heavy duty) lines. Coilmount conveyors are similar to the latter units, except that the trough in which material is conveyed is supported by cast-aluminum rocker legs and coil springs.

Motion is imparted to material carried in trough by a constant-stroke eccentric drive that produces an upward and forward oscillating movement, resulting in a gentle, continuous forwarding of materials. Available from stock in fully assembled sections of 5- to 10-ft lengths, in trough widths of 10 and 20 in., and in 10-gage or 3/16-in. trough thickness, sections can be assembled in lengths up to 100 ft. Bulletin 2644.

Link-Belt Co, Dept PR, Prudential Plaza, Chicago 1, Ill



RECESSING TOOLS in JF Series are designed for the automatic chamfering of both sides of drilled or reamed holes. Tools utilize rack and gear as actuating mechanism. Circular form cutters are employed—*Maxwell Industries, Inc, Bedford, Ohio*

Device Detects and Measures Wear In Bearings, Gears, Spindles

Bearing Tester detects and measures wear without disassembly of machinery. Instrument consists of a metal probe connected by electric cord to an electronic amplifier equipped with calibrated meter, loudspeaker, controls and, if desired, with devices for making permanent records. Malfunctioning parts transmit noise energy to supporting bearings, the probe picks up this transient energy, sensing not only total noise level but also instantaneous noise changes that indicate impending trouble.

Sperry Products, Inc, Danbury, Conn

Motorized Hand Truck Transports 1000-lb Loads

E-Z Loader has three speeds forward, one reverse, is equipped with heavy-duty transmission. Frame is welded, square tubular steel, powered by a 2-hp Continental gas engine, with double positive clutch and finger-tip safety brake control. Manual snap lock holds load securely in place.

Gross weight of 275 lb is balanced for ease of handling. Speed range is up to 4 mph.

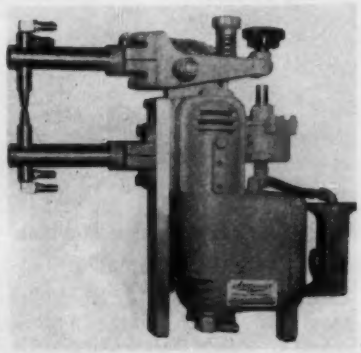
Walco Supply Co, Box 652, Glendora, Calif

Centerless Grinder Features Plunge- and Thru-Feed Grinding

Royal Master TG 12 centerless grinder handles a wide variety of materials including tungsten carbide, steels, stainless, plastic, ceramics, glass, and non-ferrous metals. On production run, machine is said to hold tolerances of 0.0002 in. and finishes of 6 to 8 mu-in.

Machine handles workpieces from 0.004 in. to 1½ in. in dia, and uses either plunge- or thru-feed grinding with conversion to either a matter of minutes. Time saving features include shorter setup time rapid replacement of work wheel, and hydraulic system for automatic cycling and wheel stressing. Machine warm-up time has reportedly been eliminated by use of precision pre-loaded ball bearings in the spindle design.

Royal Master, Inc, 111 State Highway 23, Riverdale, NJ

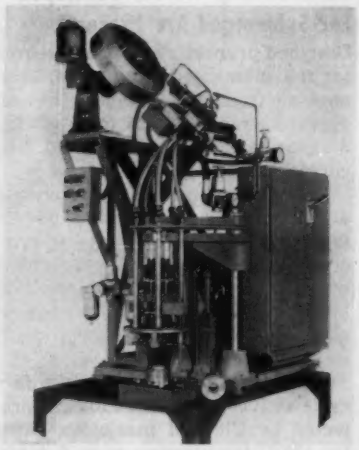


Ampower Resistance Welder Is Lightweight for Portability

Model 57 resistance welder is water-cooled, air-powered, and constructed chiefly of aluminum alloy for light weight and portability. Provision has been made on base for bench mounting, or welder may be purchased with a metal cabinet used as a stand. Model may be fastened on any type of support. Air valve may be removed and operated anywhere by foot, hand, or by cams, levers, or other mechanical means. It may also be electrically operated by solenoids. Unit weighs only 58 lb.

Specifications: power requirements, 200-240v, 50-60c single-phase; rating, 4.5 kva, 3-v open-circuit secondary; air requirements, minimum 60 psi; water requirements, minimum 20 gal per hr; throat dimensions, standard 6-in. throat by 1½-in. tip opening, with throat depth adjustable to 18 in.

Ampower Products Co, Oak Lawn, Ill



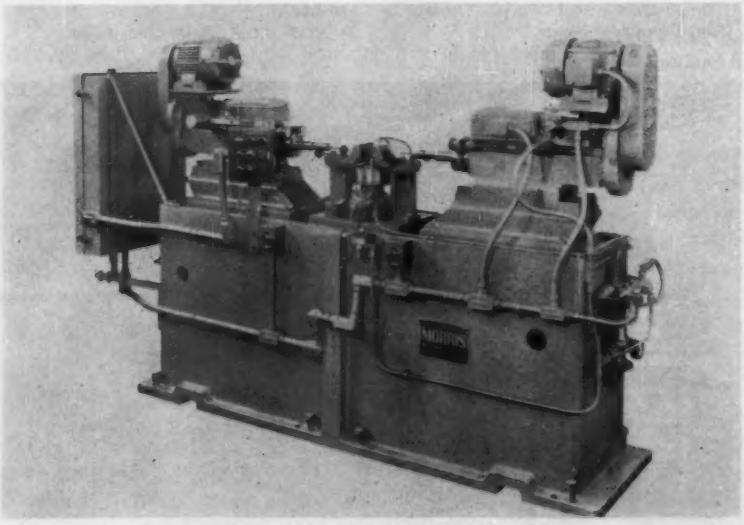
Multiple Screwdriving Machine Has Automatic Torque Control

Designed to automatically feed and drive five screws in a transmission stator, this machine handles 700 stators per hr. Head, which carries 5 Chicago Pneumatic Magnamatic air drivers, is so designed that when it approaches workpiece and air motors are about to engage, the screws are released into their proper holes, thus permitting the drivers to drive them home, maintaining pre-determined torque. Guide bushings assure accurate alignment, provide smooth operation and reduce power requirements.

Hopper arrangement, consisting of a rotating gravity-feed hopper with a slide and escapement, controls feeding of screws to head. Spring-loaded auxiliary head, with fingers, forms the lower screw escapement, for positioning and holding individual screws under drivers.

Unit connects to 440-v, 60-c line and to a 1-in. air line.

D & L Tool & Machine Co, 990 S Oakwood Ave, Detroit 17, Mich



CIRCULAR PARTS are drilled on Two-Way drilling machine which drills 2, 5, or 6 equally spaced holes in a circular part. Two Air-Oil-Matic drill units and an air-operated indexing fixture are basic components. To drill 2 holes, index selector switch is set; part is loaded; cycle start is pressed and both units drill, then retract and stop the cycle. Piece is indexed before cycle stops if 6 holes are desired; for 5 holes, left-hand unit is inoperative—*Morris Machine Tool Co, 933-16 Harriet St, Cincinnati 3, Ohio

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

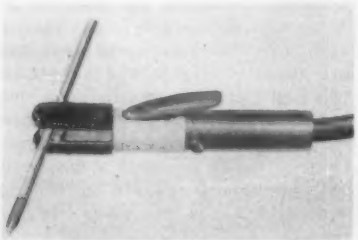
GE 1000-amp Welder Developed For Submerged-Arc Process

Designed primarily as a power source for the submerged-arc process, 1000-amp ac transformer welder has an operating range of 325 to 1000 amp. Single-phase unit has motor-driven current control.

With output open-circuit voltages of 85 to 100 volts, unit has power-factor correction capacitors and operates on a reconnectable 230/460-v input. Built into the welder is a 2-kva control transformer that can be used externally for operating auxiliary equipment.

Unit is rated for continuous-duty cycle at 1000 amp. All coils are protected by Class H insulation, rated for 130 C temperature rise. A built-in current transformer, ratio 1500/5, is provided to facilitate measurement of welding current.

General Electric Co, Welding Dept, Schenectady 5, NY

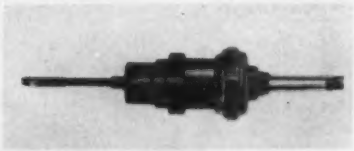


Arcair Redesigns Cutting and Gouging Torch

New Model H-3 torch, shorter and more compact, retains basic features such as rotating head and concentric cable.

Improvements include heat and impact resistant molded plastic insulators; completely insulated push button air valve that doesn't need to be held down; glass laminate sleeve to protect handle from burning; molded upper arm handle fits hand; cable connection inside handle moves cable flexure away from connection, increases cable life; insulating rubber boot on connection to welding lead can be easily opened for changing connection.

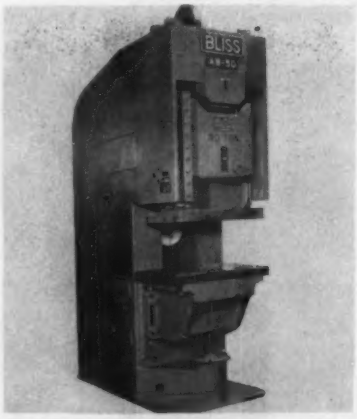
Arcair Co, 419 S Mt Pleasant St, Lancaster, Ohio



Device Makes a Honing Machine Out of Almost Any Spindle

Unahone can be used in almost any revolving spindle that will accept taper or straight shank tools. Unit has a No. 2 Morse taper shank and should be used in a spindle operating in a normally right hand direction. Advancement of the stone is accomplished by the drag placed on the threaded sleeve (largest dia on device) while Unahone is revolving. Stone is retracted by reversing spindle while holding sleeve or by stopping machine and turning sleeve to max back position by hand. Full line of adaptors, mandrels and stones available.

Dow Mechanical Corp, Thompsonville, Conn

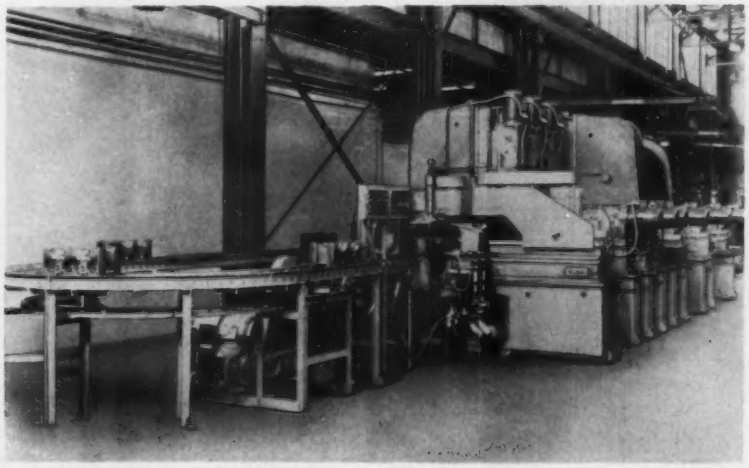


Bliss Adjustable-Bed Presses Have Enclosed Box Frame

Line of adjustable bed presses with capacities ranging from 50 to 150 tons is a fully enclosed series with a box-crown, box slide, and completely built-in controls. Air controls and recirculating oil unit are enclosed on left-hand side of press; press and motor controls are similarly flush-mounted on the right-hand side. Other features: air friction clutch and brake, adjustable rotary limit switch, and bronze-bushed bearings at the frame, connection, and gibs.

The 18 x 24-in. bed of the 50-ton model illustrated can be raised or lowered 9 in., making possible a shut-height adjustment from 11 to 20 in. Model is 37 in. wide and 74 in. front-to-back.

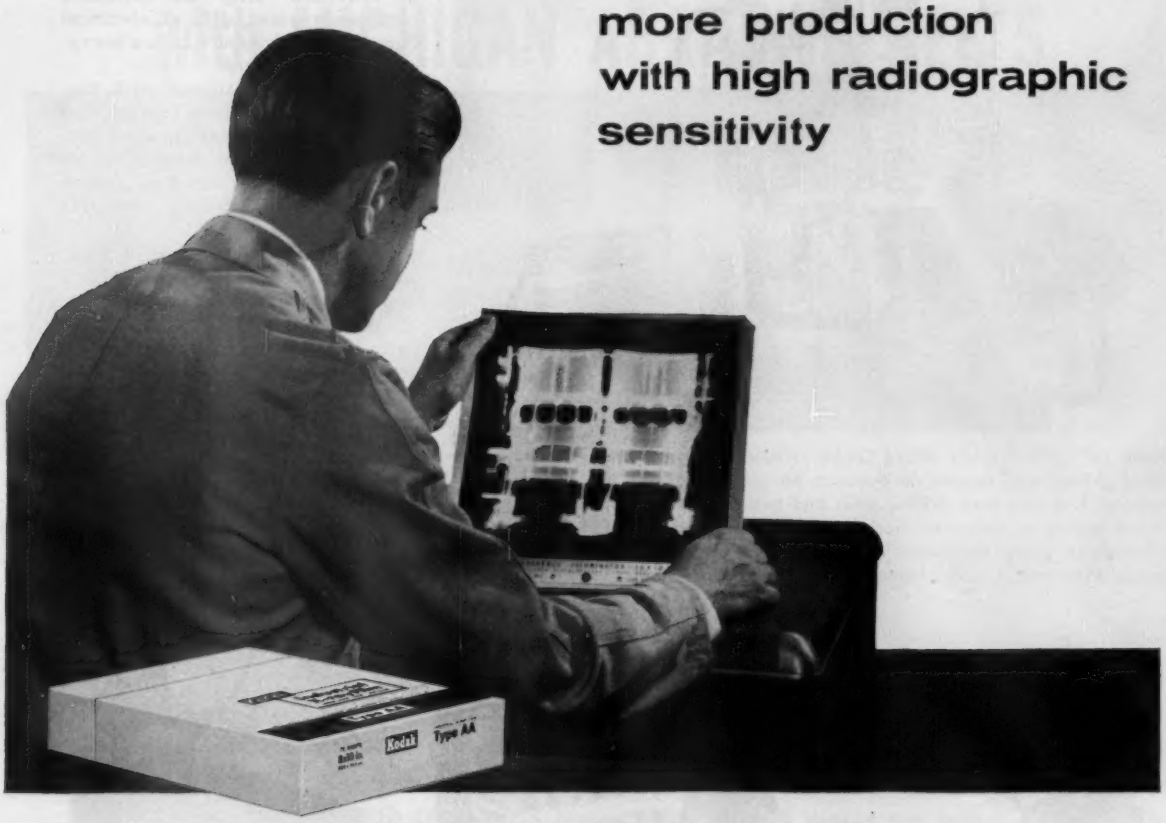
E W Bliss Co, Canton, Ohio



HYDRAULIC PUMP COVERS are rough and finish milled, drilled, countersunk and tapped on transfer machine that handles 360 pieces per hr. Operations include automatic gaging, probing, and insertion of bronze bushing in bore. Operator loads two parts on each platen-type fixture, which is automatically clamped, unclamped, and returned to loading position—*Avey Drilling Machine Co, Cincinnati 1, Ohio*

WHATEVER YOUR PRESENT RADIATION SOURCE–

more production with high radiographic sensitivity



KODAK INDUSTRIAL X-RAY FILM, TYPE AA

Whatever source of radiation you use, you'll get more high-quality work done—faster—with Kodak Industrial X-ray Film, Type AA.

For Type AA has greatly increased speed—as much as twice as fast with gamma rays and high kv x-rays. It permits inspection of thicker parts, slashes exposure time, increases production and extends the usefulness of existing radiographic equipment.

And with all this increased speed the new film equals the fine radiographic sensitivity characteristics which made Kodak Type A the most widely used x-ray film in the industry.

Kodak Industrial X-ray Film Type AA can save you time; provide clear, easier-to-read radiographs; and help turn out more work. Get all the details—either from your Kodak x-ray dealer or the Kodak Technical Representative.

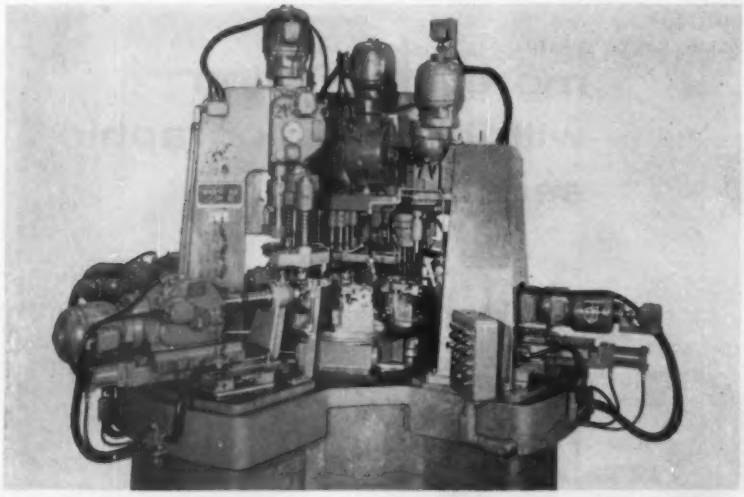
Read what the new Kodak Industrial X-ray Film, Type AA, will do for you.

- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under shop conditions of use.

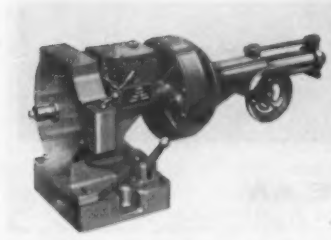
EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Kodak

For welding, use Kodak Industrial X-ray Film, Type AA, in the new 70mm x 550' package.



THREE DIFFERENT CAST IRON GEAR HOUSINGS are bored, faced, hollow-milled, drilled, and tapped on 6-station horizontal indexing drilling and boring machine. Five cam-feed drilling units and two leadscrew tapping units are employed to process the parts. Horizontal units are provided with slide adjustment to handle LH parts. Production is 256 parts per hr at 100% efficiency—*Hartford Special Machinery Co, 282 Homestead Ave, Hartford, Conn*



Greenlee Precision Borer Can Be Mounted on Any Base

Hydro-Borer Model C-4 precision borer reportedly can achieve tolerances of ±0.0003 in. and finishes to 30 mu-in. Unit can be mounted on any type of base. Fixtures can be mounted directly on the face at 90° to the spindle. Unit can be optionally furnished with an automatic trip and spindle return.

Spindle diameter is 1¼ in. with a No. 2 Morse taper, which can be supplied either concentric or eccentric. Eccentric taper permits increasing bore diameter a total of 0.014 in. in increments of 0.001 in. without resetting the toolbit.

Through a principle of positive feed by oil displacement, feed is available in one of two ranges: 0.002 to 0.004 in. or 0.0035 to 0.007 in. Oil reservoir is cast integrally with main housing. Unit feeds in either direction by reversing rotation, and has an adjustable stop.

Greenlee Bros & Co, Rockford, Ill

Industrial Truck Features Hydraulic Torque Converter

New 1½-ton capacity flatbed truck reportedly is first to use a hydraulic torque converter. Truck has top speed of 12 mph, and is powered by a 15-hp air-cooled engine. Higher speeds can be obtained by changing the gear ratio.

Two sizes of flatbeds are available from stock: 42 x 42 in., and 42 x 60 in. An 18-cu-ft bulk handling bed is interchangeable with flatbeds.

Prime-Mover Co, Muscatine, Iowa

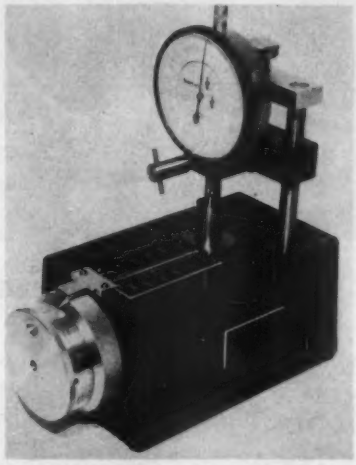
Sun-Lite Machine Lighting Units Illuminate Punchpress Die Beds

Line of Presslite machine-lighting units, designed to provide glare-free illumination of the die-bed area of punchpresses, are said to eliminate eye strain and assure greater on-the-job safety. Five standard models are available for operation on 110v 60c ac operation. They are furnished completely wired, with all electrical components enclosed within a heavy-gage steel housing.

Each light is equipped with four single-pin cold-cathode lamps that operate from two instant-start ballasts. Lamps range from 8 to 40 watts, and each is rated at approx 15,000 hr under normal operating conditions.

"Plexi-lux" louvered shield, made of thick, oil-resistant Plexiglas, is reported to eliminate all glare but to permit high light transmission with low surface brightness. Louvers are machine-etched 16 cuts per in., lengthwise or across their width to permit vertical or horizontal mounting of the lighting units.

Sun-Lite Mfg Co, 2555 Bellevue Ave, Detroit 7, Mich



DIAL-INDICATOR CALIBRATOR, Model CS-75, provides direct readings to 0.000025 in. Range is 0 to ½ in. Housing is stress-relieved Meehanite. Other features: reference scale graduated 0-500 and 500-0 for cw and ccw readings; rapid traverse for coarse adjustment; screw adjustable mount for easy zeroing of dial indicator—*Custom Scientific Instruments, Inc, 541 Devon St, Kearny, NJ*

Resharpening service for power hack saw blades reportedly gives new blade life even on third and fourth regrind for 1/3 the cost of new blade. Resharpened blades are now being used to cut stainless steel, titanium and other metals.

Peerless Tool, Inc, 38 Peck St, North Attleboro, Mass

Increase Pieces-Per-Belt *30% OR MORE* with MICHIGAN ABRASIVE BELTS

FACTS FROM TYPICAL MICHIGAN ON-THE-JOB FILE:

OPERATION: Backstand grinding-finishing die cast auto-trim parts.

FORMER BELT: Resin bond, 180 grit - 150 pieces per belt.

MICHIGAN BELT: RED COAT Resin bond, 180 grit - 250 pieces per belt.

66⅔% more pieces and nothing was changed but the belt!

Yes, it may be hard to believe but, it's true! And, as you know, nothing puts more value into sales dollars than a major cut in manufacturing costs! More and more people who *thought* they were getting peak production per belt are being amazed at the *additional* production they get from Michigan Abrasive RED COAT Resin belts, discs and sheets.

If you *think* you are getting maximum production and life from your present coated abrasives, you owe it to yourself, for the sake of profits, to test Michigan RED COAT Brand products in your operation. Only then will you *know* if your grinding and finishing costs are at rock bottom.

Michigan Abrasive is the fastest growing manufacturer of coated abrasives in the country . . . and no wonder! The proof is in *performance*. See for yourself what RED COAT, the sharper cutting, cleaner cutting, smoother finishing brand of coated abrasives, can do for you. Call your Michigan representative today or mail coupon for free, complete catalog and representative will call you for appointment. Do it soon. You'll be glad you did!

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Manufacturers of "The Humidity-Controlled Abrasive"
11911 E. 8-MILE ROAD • DETROIT 5, MICHIGAN

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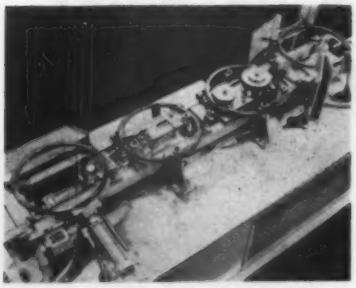


AUTOMATIC RING GEAR STRAIGHTENER, with capacity of 400 per hr, rounds up the rings from 0.060 in. out-of-round to under 0.007 in. TIR. Unit can process ring diameters from 12 to 16 in. with minimum setup time and tooling—*Cargill Detroit Corp, Birmingham, Mich*

Vibrating Feeder Operated By Pneumatic Drive Mechanism

High temperature, corrosive, and other applications that would normally damage conveyors, are possible with this completely metallic feeder, according to manufacturer.

Drive mechanism has one moving part, with no cams, bearings, belts, or gears. Enclosed construction is designed to seal out dirt and keep drive free from foreign matter. Rates of feed are easily changed and adjusted. Frequency of vibration is selected by varying the operating air pressure over a range of 30 to 90 psi, providing control of feed rates. Feeders are available in pan, trough, or tubular construction, with a selection of lengths and rates of feed.

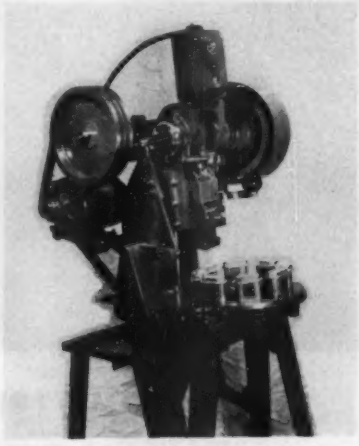
Cleveland Vibrator Co, Cleveland, Ohio

Hobart MIG Welding Unit Operates From Any DC Source

Semi-automatic welding unit for use in CO_2 and inert-gas metal-arc welding is designed for use with company's Powromatic constant-voltage welder, but will operate with any constant-voltage dc power source. It consists of a welding control and electrode drive unit, together with interconnecting gas, water, and cable assemblies.

Function of unit in consumable electrode welding is to feed the electrode into the arc at a constant, preselected speed. It provides a means for starting and stopping the arc, adjusting the electrode-feed speed, "inching" the electrode, controlling the arc-welder power, and controlling the flow of shielding gas.

Hobart Bros Co, Troy, Ohio



Eight-Station Power Press Marks Steel Parts

Equipped with an 8-station dial feed, the S-4K press can stamp up to twelve ⅛-in. characters into steel parts. Feeding is done at front of dial, a ft away from the ram. Discharge is automatic.

Press is tripped by hand lever located at safe distance from ram and dial. Interchangeable studs allow a wide variety of parts to be marked. Other specifications: stroke, ¾ in.; die space, 6 in.; throat, 4 in.; speed, 60 rpm with back gear; ram bore, 1 in.; motor, 1/3 hp 220v, 3 phase.

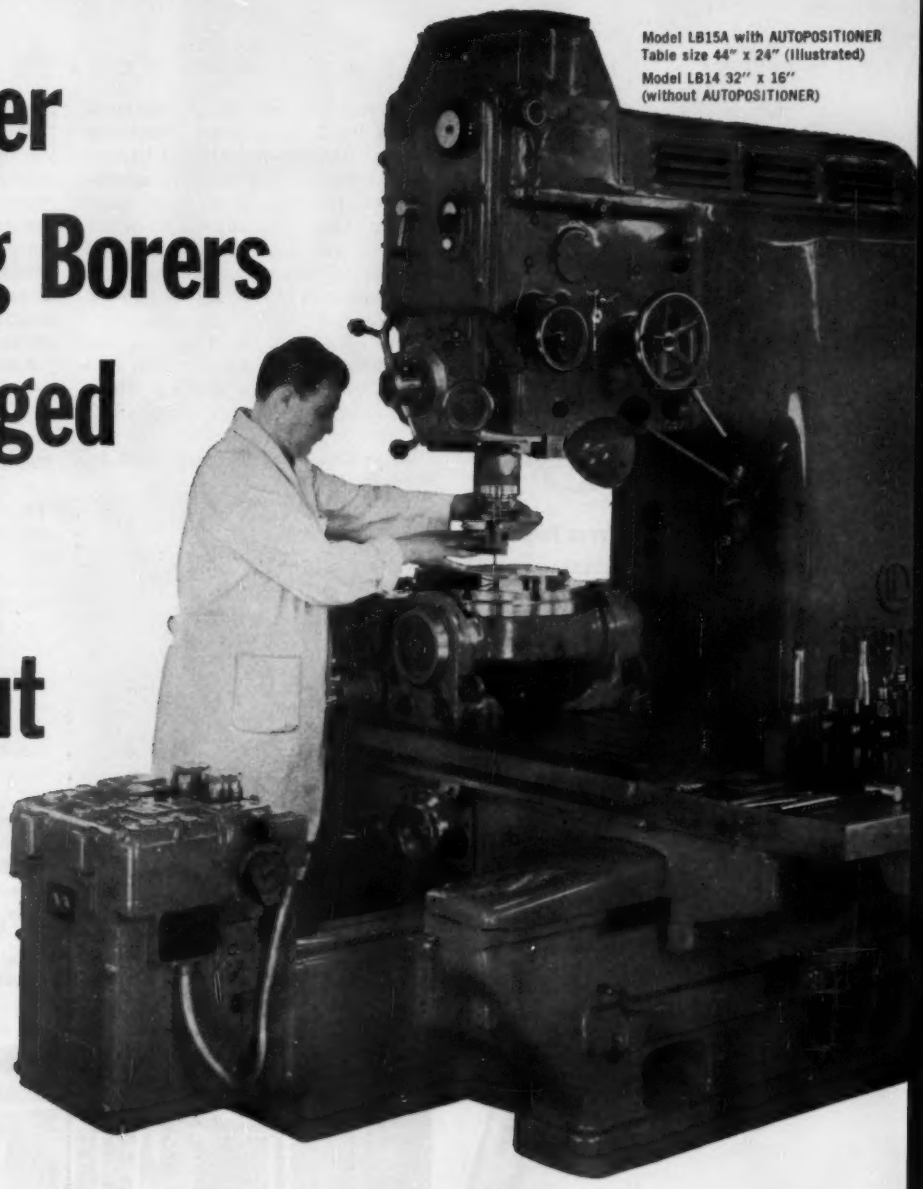
Geo. T Schmidt, Inc, 4100 Ravenswood Ave, Dept AM, Chicago 13, Ill.

FORMICA ANGLES are rolled from flat strips on this high-frequency machine built for Douglas Aircraft Corp. In photo, following features are shown: 1) Air-operated feed hopper, 2) HF heating section, 3) HF generator and control box, 4) Roll form and cooling section, 5) Variable-speed drive, and 6) Outfeed. Strips are heated to approx 300 F. Bending radius of 3/32 in. on 1/16-in. material with practically no spring-back is obtained at a rate of about 20 fpm —*Faratron, 4447 Union Pacific Ave, Los Angeles 23, Calif*

One-coat adhesives, Chemlok 220 and 201, permit simple bonding of uncured elastomers to metal. They will bond rubber, GRS, neoprene, and other like materials to such metals as steel, aluminum, copper and magnesium and to rigid plastics, and can be applied at room temperature by brushing, spraying or dipping. Chemlok 201 used as a primer will give increased bond strength.

Special Products Div, Lord Mfg Co, 1635 W 12th St, Erie, Penna

why Lindner Optical Jig Borers have changed so many ideas about jig boring



Model LB15A with AUTOPOSITIONER
Table size 44" x 24" (illustrated)
Model LB14 32" x 16"
(without AUTOPOSITIONER)

Optical measuring system does not depend on lead screws, gage blocks, bars or limit switches—is permanently protected against mechanical wear. Only a light beam touches helically scribed cylindrical measuring scales which are independent of table movement mechanism and are *immovable* in axial direction.

AUTOPOSITIONER® enables operator to preselect table position for next hole while one boring operation is in progress—eliminates non-productive time between holes. As one hole is completed, table moves in rapid traverse to the next preselected position.

Photo-electric optical centering device minimizes visual fatigue and errors in settings—permits initial and repeat settings guaranteed accurate within .00015" and readings in .00005".

Projection screen eliminates operator eye strain and bending—helical line from measuring scale is projected on 2½" x ¾" screen which operator reads in standing position without eyepiece.

Automatic table clamping prevents errors in clamping and unclamping table between movements.

● ***Send for 25-minute movie film demonstration***

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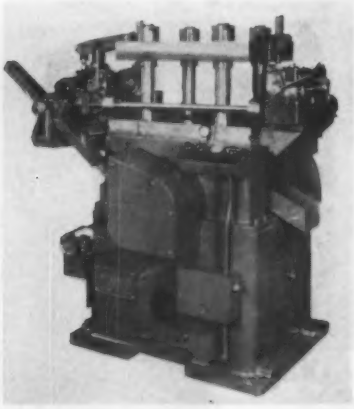
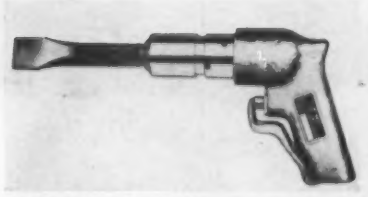


Brandes Automatic Press Runs At 500 Strokes Per Minute

30-ton automatic press can operate at speeds up to 500 spm, made possible by such features as air counterbalance, counter-balanced crankshaft, and low center of gravity. Draw rods are guided above and below crankshaft. Press is reported ideal for blanking large quantities of small parts.

Unit is only 64 in. tall. Standard die area is 10 x 31 in. Press is also available in a double-throw version with die area 30 x 31 in.

Brandes Press Co, 6408 Euclid Ave, Cleveland 3, Ohio



50-oz Air Hammer Incorporates Metering Trigger Control

Big Bully Model SP1200 for scaling, chipping, chiseling, or cutting, measures 6 in. long, consumes 6.5 cfm of air at 1500 psi.

Metering trigger permits control of power from 0 to 9000 blows per minute. Unit attains full speed and power on less than 7 cfm.

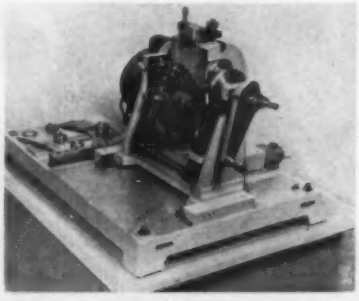
Superior Pneumatic & Mfg, Inc, 4758 Warner Rd, Cleveland 25, Ohio

Ultra-fast Induction Hardening Process Requires No Quenching

New induction heater line incorporates powdered core output transformers. A typical application was to harden the knurled end of a spring-shackle bolt to a depth of approx 0.012 in. without hardening or even heating the areas adjacent to the knurl. With this unit, all operator is required to do is to push pin into the coil where it automatically turns on the machine for the interval needed, and remove it. Time required is 1/10 sec on a 10-kw machine.

Because of the rapid heating, no quenching is required; residual cold of the part does the cooling. Theoretical output is approx 10,000 units per hr.

Radio Frequency Co, 44-46 Park St, Medfield, Mass



Radius Grinder Can Grind 180° Radius in Single Setup

Nassau convex radius grinder can grind either the right or left side of a milling cutter on a single point tool to a 90° radius. It can also grind a 180° radius in a single setup. Cutters up to 6 in. in dia, and from practically 0 to 2 in. thickness, can be ground on the machine.

Total setup and machining time for the average milling cutter is reported to be less than one hr. Ability to read micrometer dial and vernier height gage is only skill needed to set up and operate this machine.

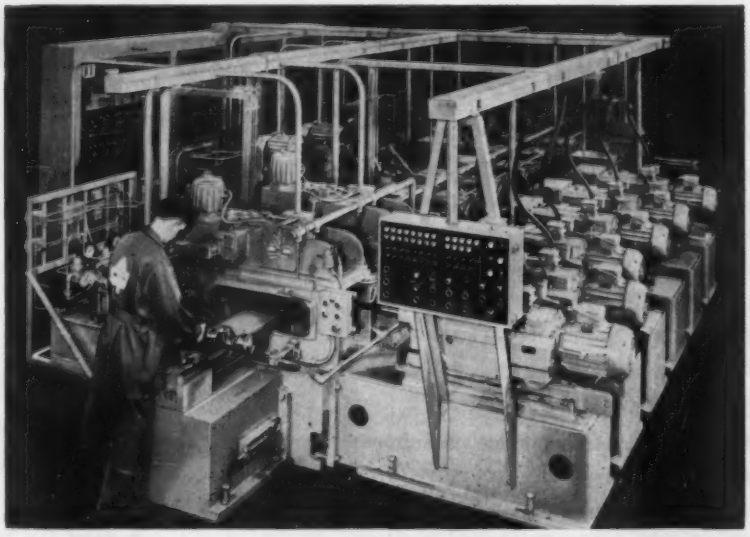
Nassau Tool Work, 208 Meacham Ave, Elmont, LI, NY

Manual arc-welding electrode classified AWS E6013 and designated W613B is heavily coated mild steel, designed to operate on ac or dc in all positions. Moderate arc force reportedly is sufficient to give adequate penetration, and the steady spray-type transfer aids in control and direction of deposit.

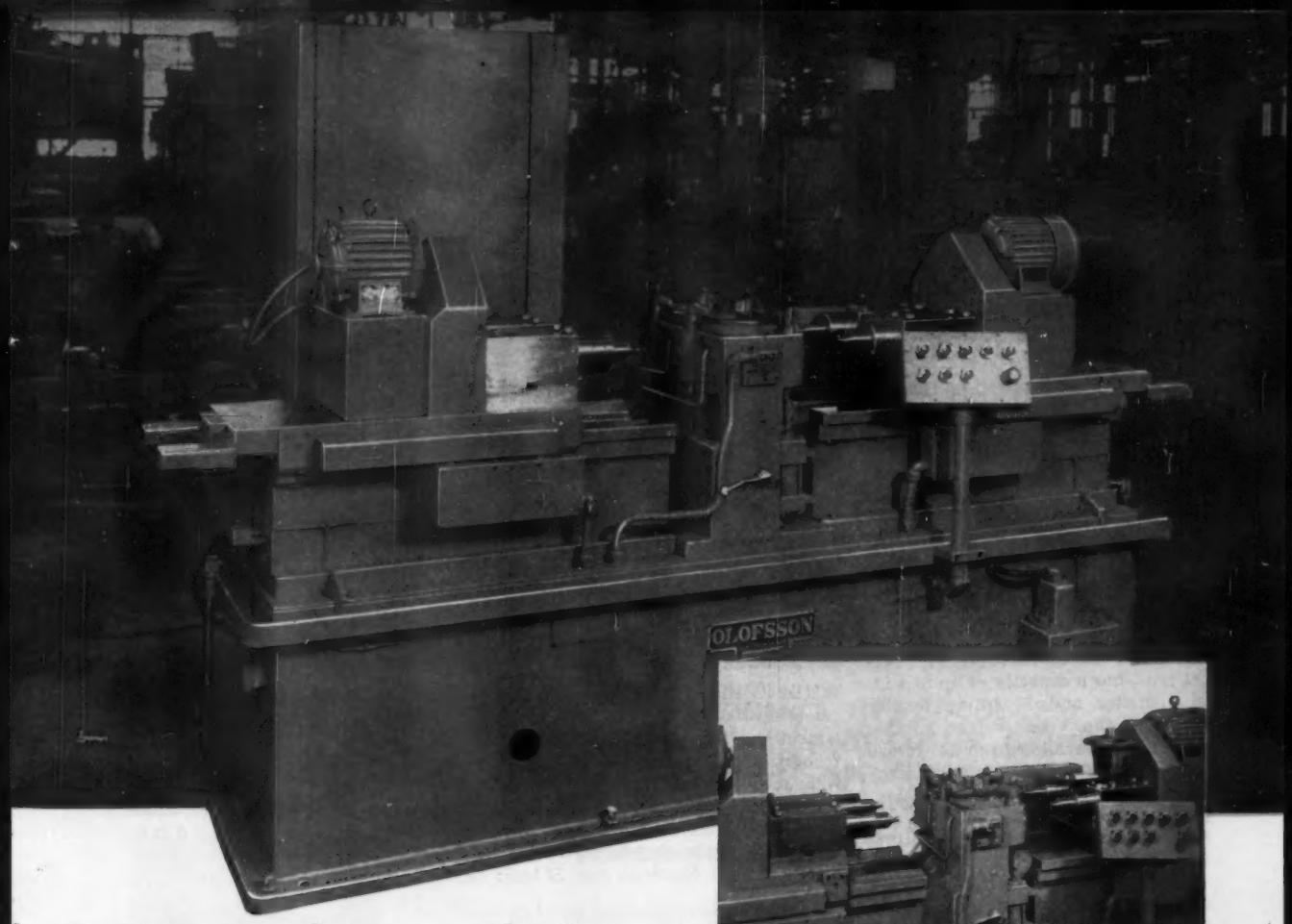
General Electric Co, Schenectady 5,

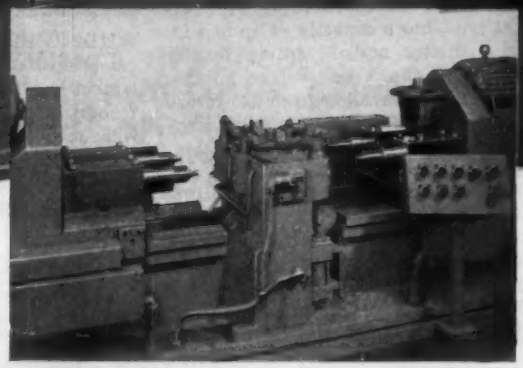
Automatic directional valve affords instant switch-over from automatic to manual control of diaphragm-operated valves, cylinders and similar devices. Valve consists of a captive Hycar ball which shuttles between two seats in bronze valve body. Device is available with ¼- and ⅜-NPT ports.

Valvair Corp, 454 Morgan Ave, Akron 11, Ohio



AUTOMOTIVE CRANKSHAFTS are machined on this 11-station transfer machine which performs 36 drilling, reaming, milling, facing, boring, chamfering and tapping operations. Production rate is 48 shafts per hr at 80% efficiency. Machines are equipped with motorized track-type chip conveyors and a magnetic separation type coolant system—*Standard-Modern Tool Co Ltd, Toronto, Canada*





Olofsson Two Station Precision Boring Machine arranged with Way Units. Conforms to J.I.C. electrical and hydraulic standards.

Is any part of your production COSTING TOO MUCH?

Today's competitive market demands constantly increasing production per man hour. Any machine tool which can't deliver that kind of production is too costly to operate. That's why an automotive manufacturer recently consulted with Olofsson engineers to increase production and lower unit costs on a boring operation. The result...

TYPE OF MACHINE—Olofsson Two Station Double End Precision Boring Machine arranged with Way Units.

WORK PERFORMED—Finish bore two holes, *in line*, simultaneously in cast iron differential cases.

RATE OF PRODUCTION—250 cases per hour.

MACHINE OPERATION—The operator loads the part into the nest and presses the clamp and start cycle button. Both units bore "in" simultaneously and rapid return to unload position. Hydraulically operated finger clamps release the part automatically when both units are in clear position. A manually operated elevator device is used to help insert and unload part from nest with ease.

Hand cycle provides additional retraction of spindles for setting or removal of cutting tools, also independent control of either unit.

Perhaps you have a tough production problem which can be solved efficiently and economically with Olofsson Special Machinery. You'll find it "pays to specialize with Olofsson".

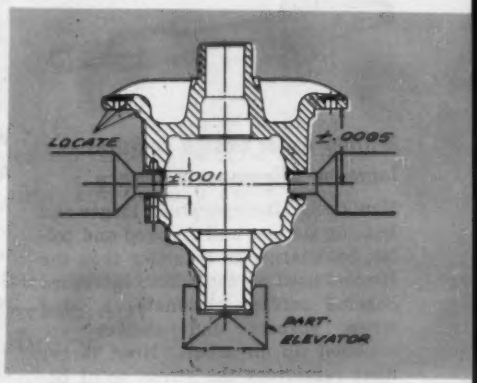


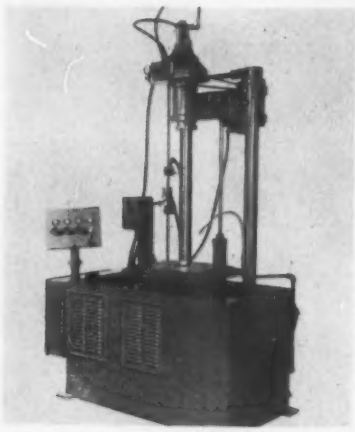
Diagram of differential case clamped into position for simultaneous, double-end precision boring operation.

Put the Olofsson Engineering Department to work for you. Write today. Or phone us at IVanhoe 4-5381, Lansing, Michigan.

THE OLOFSSON CORPORATION

2728 Lyons Avenue • Lansing, Michigan

Manufacturers of Special and Automation Machinery and Precision Boring Machines

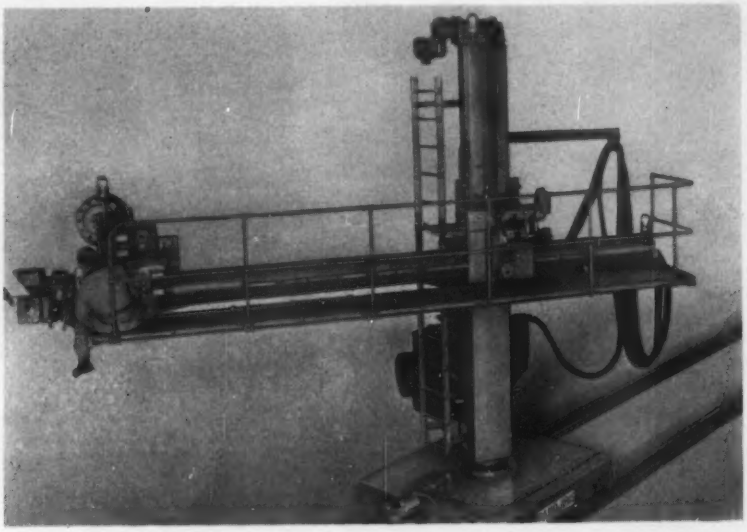


Vertical Honing Machine Takes 12-in.-High Work

Model VA honing machine, of vertical type, has a capacity of up to 4 in. in diameter and 12 in. in height. Speed of the V-belt-driven spindle is infinitely variable from 225 to 550 rpm. Adjustable limit switches control and set stroking lengths. Jogging switches permit working in any section of the part without resetting the limit switches.

Honing cycle is controlled by an electronic timer adjustable within a range of 6 to 120 seconds. Machine is 84 in. high, 40 in. wide, and 52 in. long.

Superior Hone Corp, 1607 Elreno St, Elkhart, Ind



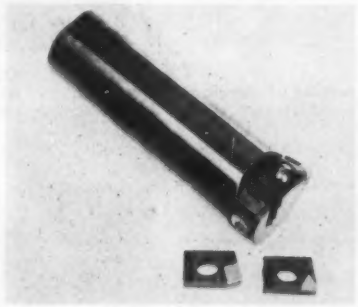
WELDING HEAD MANIPULATOR, Model 12 x 12 RBM, is shown here with a cat-walk in place of operator's pulpit. Cat-walk allows inspection personnel to inspect welding operation on large tanks. Manipulator has arc height of 12 ft, horizontal arc travel of 12 ft and is mounted on self-propelled travel car with 360° manual rotation of column (power rotation also available). Power source and flux recovery system are mounted on column bracket; manipulator and welding controls are at end of boom. Other models range from 6 x 6 ft to 24 x 30 ft (arc height and horizontal arc travel) in three series—*Pandjiris Weldment Co, 5151 Northrup Ave, St Louis 10, Mo*

Milling Arbor Design Features Increase Alignment Accuracy

New design incorporates a larger end bearing surface and grooved end collar, both larger in diameter than the spacers used on the arbor. Increased bearing surface eliminates cocking when spacers and sleeves are snubbed up on arbor. New, larger fillet reinforces the stress point between arbor and shank, guarding against breakage under heavy loads.

Style A, for light work and small cutters, is made in standard sizes from ⅞ to 1¾ in. Style B, for larger cutters and dual overarm support, is furnished in sizes from ⅞ to 2½ in.

Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, Ill

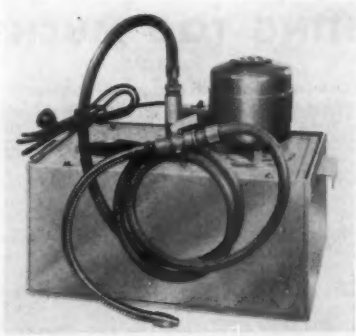


Wesson Boring Bars Are Micro-Adjustable

Micro-adjustable boring bars enable operator to transfer from a turning to a threading or facing operation, or from one requiring triangular inserts to another job requiring round or square throwaways. Complete tool change requires only the interchange of one piece—the standard anvil. The rest of the boring bar, including chip-breaker clamp and micro-adjustment, does not require any change.

The interchangeable anvils are fitted with carbide anvils to support the throwaway inserts.

Wesson Co, 1220 Woodward Hts Blvd, Ferndale, Mich



Sutton Coolant Pump Features All-Bronze Construction

Model CTU-115 coolant pump has all-bronze pump housing, impeller, and shafts that reportedly provide longer life than is possible with cast-iron units. There are no bearings or metal-to-metal contact, so that abrasive-laden liquids can be pumped without harm. Unit will pump coolants, cutting oils, soluble compounds, and other liquids to machine tools.

Motor is over-size and runs at slow speed. Unit comes equipped with 6 ft of flexible hose, 17-in. flexible nozzle with shut-off valve, 8 ft of rubber cord, and 5-gal tank.

Sutton Mfg Corp, Norfolk, Va

Specify this

POPE

SUPER PRECISION, 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD WITH ANGULAR ADJUSTMENT IN A VERTICAL PLANE

and get these seven savings:

1. Strong, long lasting tool cutting edges because cup wheel cutter grinding can be used for practically all clearance angles.
2. Tooth rest stays on the center line of the cutter for practically all grinding on centers or in the work head.
3. A single set-up grinds most cutters and reamers all over, using the swivelling table and Pope tilting head.
4. No more mistakes on clearance angles. They read directly in degrees from the scale provided on the head.
5. No more trouble or time wasted getting the right clearance angle on the tough ones such as slab mills, **taper reamers,** angular cutters and form tools.
6. No more heat checking of cutters. One safe speed — 3600 RPM — for all wheels generally used on cutter grinders.
7. Quick, easy adjustment saves you time and money every time you grind a tool.

Ask us to send you complete specifications including price and delivery.

No. 118

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ENGINEERS AND BUILDS STANDARD AND SPECIAL PRECISION ANTI-FRICTION BEARING SPINDLES FOR EVERY PURPOSE

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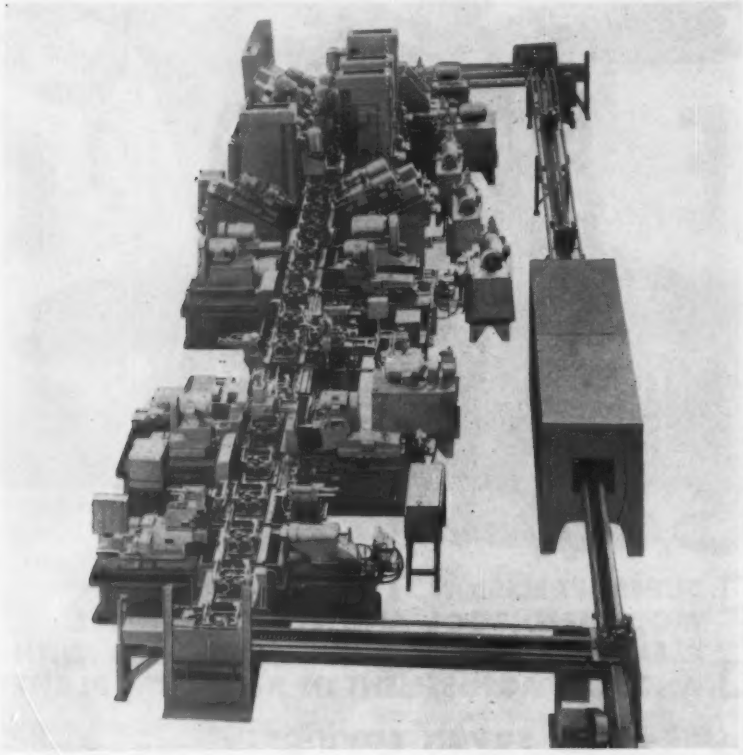
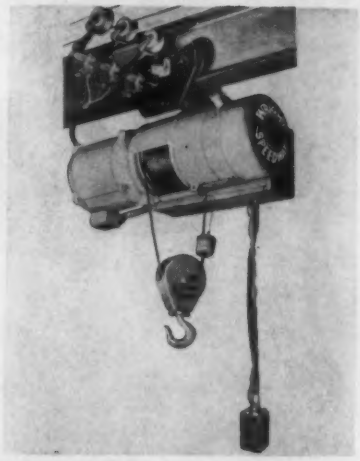
Established 1920

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



AUTOMATIC TRANSMISSION EXTENSIONS are machined on this 25-station Economatic machine. Two different parts are automatically positioned and clamped in palletized fixtures. Unit performs 30 operations, including drilling, tapping, rough and finish boring, automatic assembly of liners, automatic gaging, milling and facing. Production is 180 pieces per hr at 100% efficiency—*Buhr Machine Tool Co, Ann Arbor, Mich*

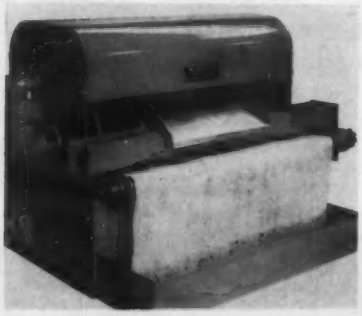


TWO-SPEED ELECTRIC HOIST, of Frame 1 Wright Speedway line, provides fast lifting and lowering speed and a slow work-positioning speed (1800/450 rpm). Housing is designed for easy servicing. Unit is available in parallel, cross, hook, rigid or bolt mounting, and features an automatic brake that is immersed in oil to assure uniform operation in varied atmospheres—*American Chain & Cable Co, Inc, 929 Connecticut Ave, Bridgeport 2, Conn*

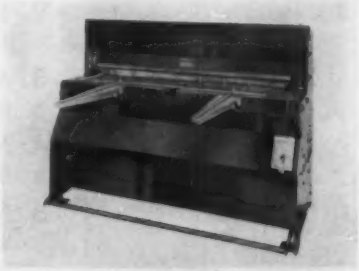
Concentricity Attachment For Bryant Bench Gage

Attachment is used on Bryant B-21 bench gage (AM—Mar 12, '56, p311) to check concentricity of small internal conical surfaces in relation to a thread. Checking is done by a pivoted pin follower which contacts the conical surface and transmits any eccentricity of the surface to a dial indicator. A ball slide follower is used in the attachment to compensate for thread progression and to allow checking through one or more full turns of workpiece. Size of thread is checked at same time.

Bryant Chucking Grinder Co, Springfield, Vt



COOLANT FILTER, Barnesdril Kleenall, has trough-type intake distributor (formerly pipe-design) for easier maintenance—*Barnes Drill Co, Rockford, Ill*



New Features Added to Whitney-Jensen Power Squaring Shears

Hold-down arrangement for line of shears has been designed so that regular spring hold-downs are assisted by three adjustable springs to insure a positive-acting, non-slip grip. Gages at both front and rear of machines have crank adjustments and calibrated scales.

Blades are made with four cutting edges, and the guards have clear plastic panels to provide visibility of cutting area. Both main drive shafts are mounted in self-aligning ball bearings.

These features are available in the 36, 52 and 72-in. models.

Whitney Metal Tool Co, 72½ Forbes St, Rockford, Ill

Lapointe Machine Tool Company, Hudson, Massachusetts

FIRST OF ITS KIND IN THE WORLD!

...And It's Lubricated by Cities Service Pacemaker 400 T Oil!

LAPOINTE MACHINE TOOL COMPANY, originator of the broaching method of cutting metal over 50 years ago, has now originated the first vertical broaching machine with variable speed electro-mechanical drive.

Purpose of the huge, gear-driven machine is to increase tool life up to 500% through smoother operation, thus saving down time and producing more accurate work.

Selection of a lubricant for the new machine was of special importance because of the tremendous pressures it develops: normally 30,000 pounds, sometimes up to 60,000 pounds. Of the many brands of lubricants Lapointe tested, Cities Service Pacemaker 400 T had the necessary requirements for the job . . . so naturally, this superior lubricant got the job.

"We test the machines with Pacemaker 400 T at the factory and then put it in again when the broaches are assembled at the buyer's plant," says Lapointe. "It offers all the characteristics we need: Good film strength, high viscosity index, and exceptional anti-foam and anti-oxidant qualities. Needless to say, we're pleased and impressed with this Cities Service lubricant."

Like scores of others, Lapointe has discovered the search for a proper lubricant ends at the Cities Service label. Altogether, there are hundreds of Cities Service products for the exacting needs of industry. For more information, talk with your nearby Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

Quick Facts About New Broaching Machine

USES: Now used for broaching aircraft engine turbine buckets, but can be adapted to general broaching.

ADVANTAGES: Increases tool life 400-500% through smoother operation, less down time. Produces more accurate work. Variable cutting speed: 12 to 75 FPM. Available in single or double ram models with 72" to 100" stroke.

Quick Facts About Pacemaker 400 T Oil

USES: Propulsion turbine units where oil is circulated under heavy pressure. Widely used in naval and commercial vessels, high speed industrial machinery.

ADVANTAGES: High viscosity index, excellent heat resistance and film strength. Chemically fortified against oxidation, rust, and foaming.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

A BETTER METHOD OF MACHINING

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

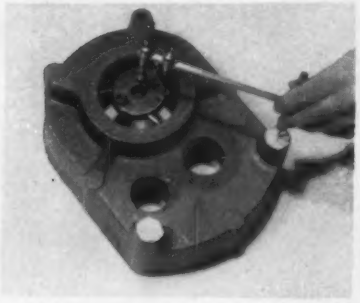
Scrap Chopper Features Orbital Shearing Action

Scrap Chopper features an orbital shearing action which allows equal opening at each end of cutting blades thus permitting free entrance of material through the blades. Stock too thick simply stalls the unit without danger of breakage to any parts or to protected motor.

Chute through which material passes to cutting blades has a reciprocating action which prevents stock from hanging-up. Cutting blades are ⅜ in. thick, are self-aligning and can be reground to half the original thickness and still be used.

Unit is powered by 1/3-hp, 115/230-v, single-phase, 60-cps drive, and has a capacity of 6 in. wide x 0.065 in. thick in mild steel.

Cooper Weymouth, Inc, 600 Honeyspot Rd, Stratford, Conn



One Turn of Allen Wrench Locates Center With New Center Finder

Center Finder comes in 3 sizes: one for establishing centers in holes ranging from 1 to 2½ in. in dia, one for holes from 2½ to 6½ in. and one for holes from 6½ to 15½ in. in diameter.

Counter-clockwise turn of Allen wrench extends three equal length machined pins which will make contact with inside wall of hole. Device is locked by a thumbscrew, and is now ready for use with dividers or trammel. Center button can be removed and replaced by a transfer punch if counterboring is necessary. Larger sizes available on special request.

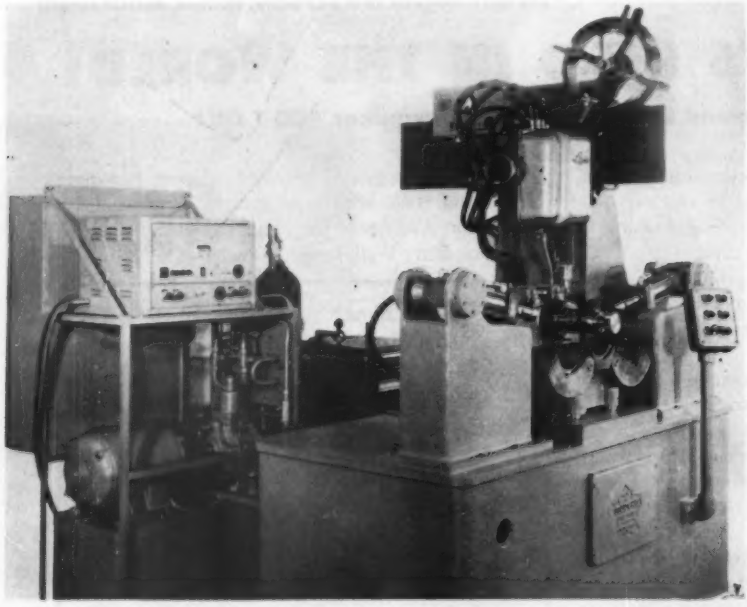
C & B Tool & Machine Co, 2944 W Franklin St, Elkhart, Ind

Console-Model Hardness Tester Can Test 1000 Pieces per Hour

Testing unit, designated Console Model Fully Automatic Hardness Tester, Size 3, classifies tested workpieces into one of three categories—correct, too hard or too soft. Device has controlled hardness limits as close as two Rockwell numbers, is equipped with automatic counter and has automatic stop for improperly fed pieces.

Workpieces may be tested in one of two ways: manual feed and manual disposal; or semi-automatic, with manual loading and automatic disposal and classification as to hardness. Plunger extensions allow unit to test materials varying from 0.030 to 6 in. thick. Switch changes cycle from continuous to single operation.

American Chain & Cable Co, Inc, 929 Connecticut Ave, Bridgeport 2, Conn

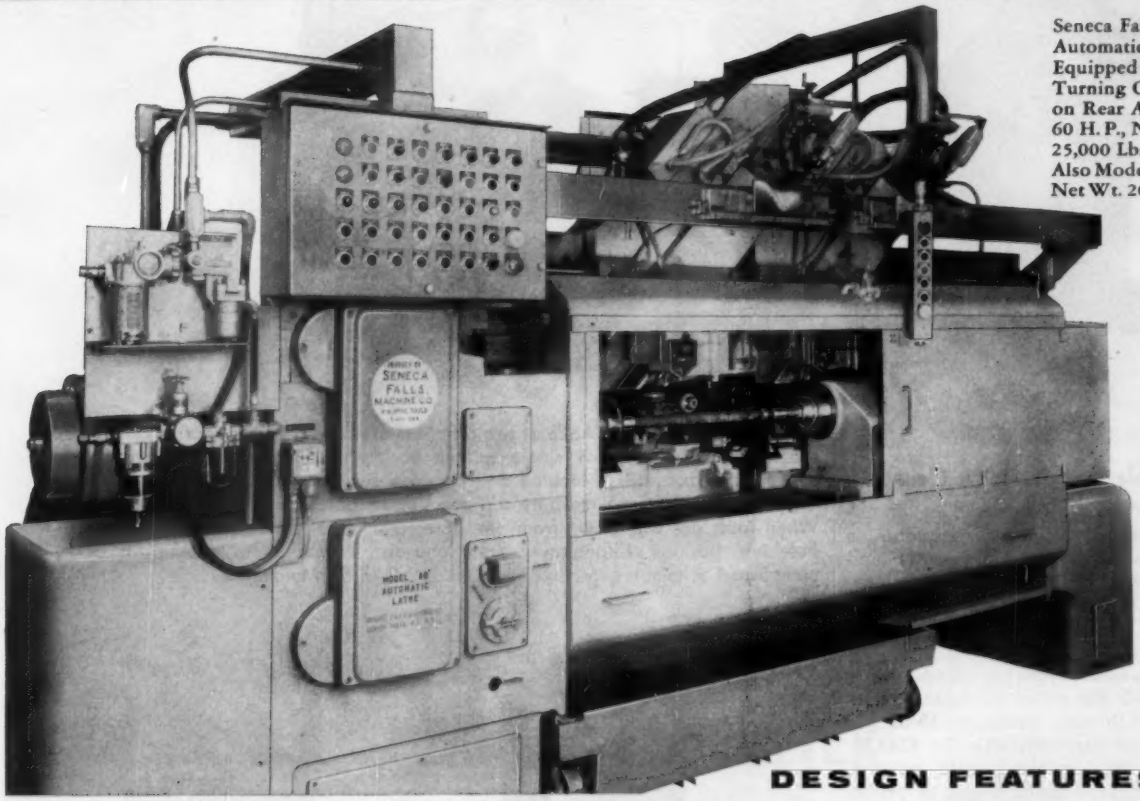


STATOR CORE WRAPPERS for fractional-hp motors are formed and welded on this machine in 36 sec. Stator, complete with windings, insulation, and lugs, is placed on mandrel; preformed wrapper sheet is positioned on forming jaws; bottom die rises against underside of wrapper; side jaws move into position and are clamped by hydraulic cylinders. When jaws close, Linde Sigma-welding outfit starts automatically and welds seam. Jaws open at end of welding cycle and piece is ejected—*Standard-Modern Tool Co, Ltd, Toronto, Canada*

Coated stainless electrodes for lightgage sheet and heavy plate are offered in two types: Aerocor is designed for welding aircraft and lightgage stainless steel. Fabricor is intended for welding stainless plate. Both electrodes are applied with dc reversed polarity.

Arcos Corp, Philadelphia, Penna

A BETTER METHOD OF MACHINING REAR AXLE, AND OTHER SHAFTS



Seneca Falls Model AQ Automatic Lathe Equipped for Stem End Turning Operation on Rear Axle Shaft. 60 H.P., Net Wt. 25,000 Lbs. Also Model LQ, 30 H.P., Net Wt. 20,000 Lbs.

● The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The line drawing shows a machining operation on the stem end of a rear axle shaft which is rough turned with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

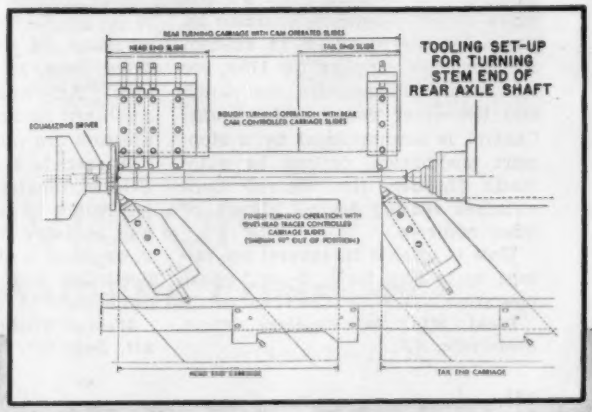
The machining operation is completely automatic . . . the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.

A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements,

Seneca Falls Machine Co., Seneca Falls, N. Y. Write for Bulletin Q-56-A

DESIGN FEATURES

- ▶ **Simplified changeover features for reduced set-up time.**
- ▶ **Feed rate may be automatically changed during cutting cycle.**
- ▶ **Streamline design for efficient chip guarding.**
- ▶ **Screw feed to all carriages.**
- ▶ **Four speed head with automatic change-over.**
- ▶ **Large chip flow area.**
- ▶ **All templates clear of chip area.**
- ▶ **All ways hardened, ground and replaceable.**
- ▶ **Open front design facilitates loading and unloading.**
- ▶ **Straight line diameter adjustment for tracer tools . . . no shoulder length change to correct.**



NEW SENECA FALLS
MODEL LQ AND AQ AUTOMATIC LATHES

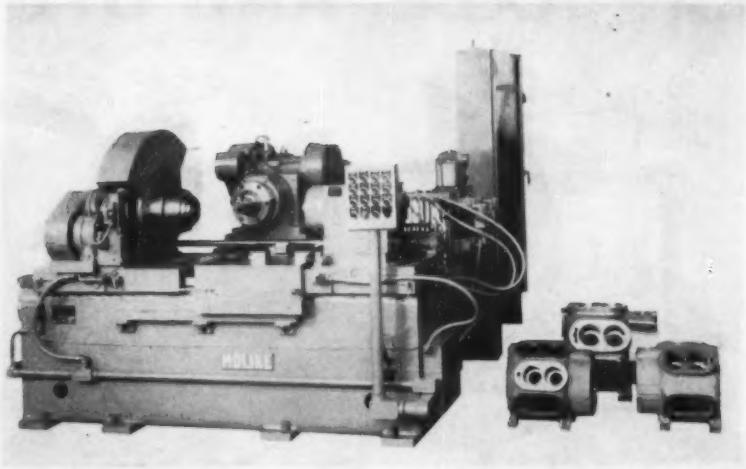
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

Portable Electric Steam Cleaner

The Polaris, designed for maintenance and service departments, is filled with hot or cold water and plugged into a 110-v electric outlet. Detergents can be placed directly into water tank to be mixed with steam in use.

Unit, said to operate on one filling of water for about an hour, generates 90-lb max pressure. Model 12 has 3-gal capacity, sells for $249.50. Model 24, equipped with rubber-tired wheels, holds 6 gal, is priced at $299.50.

Elroy Products Co, 529 S Seventh St, Minneapolis 15, Minn



COMPRESSOR CRANKCASES of two different sizes are bored to receive cylinder sleeves on Model MR149 single-spindle boring machine. After crankcase is loaded into fixture, it is located and clamped by hydraulic power. Operations include rough bore, counterbore top and bottom bores, and face bottom bores. When tools are withdrawn from one bore, crankcase is indexed to bring next hole into position. Changeover, from one size crankcase to another, is accomplished in minutes—*Moline Tool Co, 102 20th St, Moline, Ill*

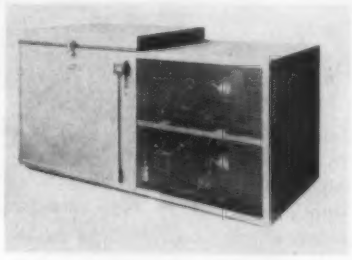
Diehl Power Transmitter Is Solenoid Controlled

Type J power transmitter is a solenoid-controlled unit that permits remote or automatic control for rapid stop-start machine operation. Maker reports that 40 or more starts per min are possible when transmitter drives machines with reasonably low inertia.

Motor uses a constantly running, motor-driven flywheel with a short throw clutch. Clutch is actuated by two solenoids arranged in tandem and normally supplied for 115v, 60c operation. One engages the clutch and the other engages the brake. Control is accomplished by a stop-start pushbutton, or can be automatic through the use of limit switches, sensing devices, timers, or other controls.

Unit is offered in several hp ratings, up to 2 hp, for 1-, 2-, or 3-phase operation.

Diehl Mfg Co, Finderne Plant, Somerville, NJ



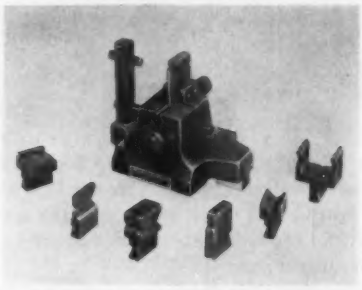
Webber Low-Temperature Cabinet Features Rapid Pull-Down

Model WE-8-125 industrial freezer, designed for testing electronic components, stabilization of metals, and thermal contraction and expansion fitting, has an 8-cu-ft capacity. Pull-down on the unit is from ambient to –100 F in 30 min with a temperature range from ambient to –125 F.

Four baskets measuring 10 x 10 x 10 in. handle components; inside dimensions, 24 x 24 x 24 in.; outside, 72 in. long, 36 in. wide and 38 in. high. Air-cooled, water-cooled or combined air and water-cooled compressors are optional.

A cascade system using F-22 and F-13 eliminates loss of refrigerant when unit is not in use. Unit operates on 440 v, 3 phase, 60 cps or 230 v, single or 3 phase, 60 cps. Casters, portholes, and viewing window are optional.

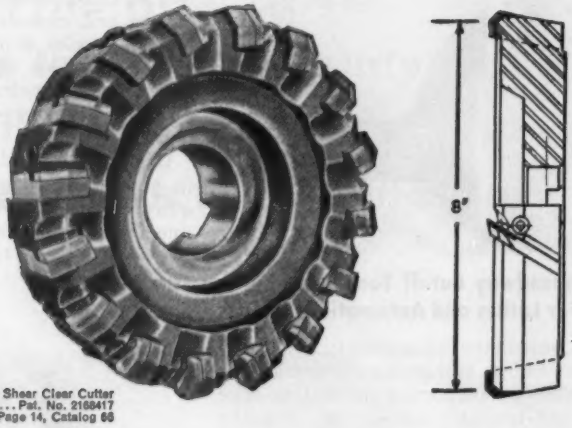
Webber Engineering Corp, P O Box 217, Dept 287, Indianapolis 6, Ind



PART-HOLDING FIXTURE for optical gaging, called Multi-Use Stage, clamps quickly on worktables of all standard contour projectors and optical comparators. Device is suited to staging cylindrical parts as well as many non-cylindrical pieces. Several interchangeable and adjustable part holders can be accommodated—*Optical Gaging Products, Inc, 26 Forbes St, Rochester, NY*

Dry film lubricant, Molykote 174 X, developed for drawing and forming of titanium, titanium alloys, chromium and stainless steels at elevated temperatures, consists of extremely fine particle size graphite combined with a high temperature binder and dispersed in an aromatic solvent system. It has been used for drawing and forming at 600 F to 1400 F and can be applied by spray or brush.

Alpha Molykote Corp, 65 Harvard Ave, Stamford, Conn



Ingersoll Shear Clear Cutter
27600 series... Pat. No. 2168417
Page 14, Catalog 66

Feed rate increased 2½ to 5 times at Vaughn with this INGERSOLL SHEAR CLEAR® CUTTER

The cutter previously used was nullifying the investment in a new standard, knee-type milling machine. The machine had more power than was being utilized. The feed rate was only 12″ per minute. The change to Ingersoll Shear Clear permitted the Vaughn Machine Company, Cuyahoga Falls, Ohio, to capitalize on its machine investment and obtain the economy and efficiency of increased feed rate. A feed range of 30″ to 60″ per minute, when milling rough forgings and steel castings, is now continuously maintained.

Ingersoll inserted blade cutters are used on all makes of machines for milling and boring a wide range of materials. An Ingersoll Cutter Division representative will be glad to discuss this and other feed rate experiences with you.

Whether you are concerned with feed rates, longer tool life, finish or cutter costs, the new Ingersoll cutter catalog will be a valuable guide. Write Department 66K.

Use this new 82 page guide for selecting the right inserted blade milling and boring cutters for your work. Write for catalog #66, today.

Representative Ingersoll Customers in Diversified Industries

ADAMSON UNITED CO.
ALLIS-CHALMERS MFG. CO.
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E. W. BLISS COMPANY
BUCYRUS-ERIE COMPANY
CHASE BRASS & COPPER COMPANY, INC.
CLARK EQUIPMENT CO.
THE CLEVELAND PUNCH & SHEAR WORKS COMPANY
THE COOPER-BESSEMER CORPORATION
CROSS COMPANY
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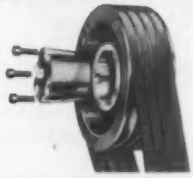
HERCULES MOTORS CORP.
LINK-BELT COMPANY
LUFKIN FOUNDRY & MACHINE COMPANY
PRATT & WHITNEY COMPANY, INC.
THE PRODUCTO MACHINE COMPANY
RYAN AERONAUTICAL CO.
SIMONDS SAW & STEEL CO.
WAYNE DIE & TOOL CORP.

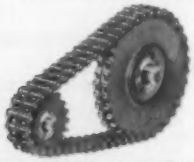
CUTTER DIVISION

THE INGERSOLL MILLING MACHINE COMPANY

ROCKFORD ILLINOIS



TAPER-LOCK
SHEAVES
Easy on — easy off! Mount flush!



TAPER-LOCK
SPROCKETS
No reboring — no waiting!

SC AND SCM
BALL BEARING PILLOW BLOCKS
"The seal won't blow!"

•

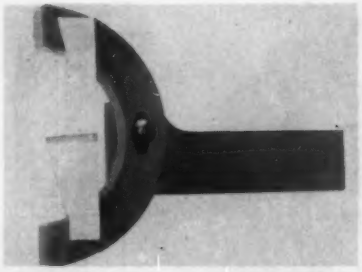
Write for Bulletins!

- Taper-Lock Sheaves. Drive tables and technical data. Bulletin A-661
- Taper-Lock Sprocket and Dodge Roller Chain data. Bulletin A-644
- Rolling Bearings—SC, SCM and Dodge-Timken. Bulletin A-638

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

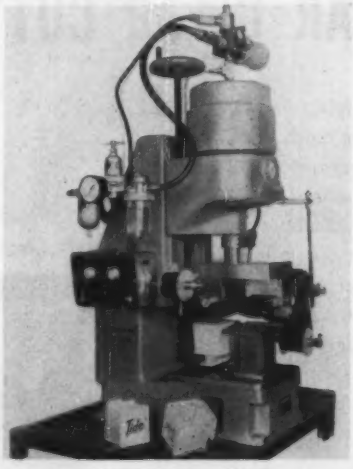
NEW SHOP EQUIPMENT



Speedway Cutoff Tool Assembly For Lathes and Automatic Machines

Construction of Speedway cutoff tool assembly eliminates overhang problem by supporting the cutting edge by tension instead of bending moment. This permits use of a much thinner blade in relation to depth of cut. Cuts up to 4½ in. require a blade thickness of 0.095 in. Low cost tool is suited for interrupted cuts on hex, octagon and square material. Vertically-hung blade is said to eliminate chatter.

Wye-Stanley Tool Co, 3503 E Olympic Blvd, Los Angeles 23, Calif



Acromark Stamping Press Stamps Up to 1000 Pieces per Hour

Acroleaf Model 250-H hot stamping press, which will stamp up to 1000 pieces per hr with manual feed or a possible 300% more with automatic feed, has a die area of 6 x 6 in., taking roll leaf up to 6 in. wide, and has a 9½ in. high adjustable die space with an 8 in. depth of throat.

Equipped with automatic controls to regulate temperature of heated head, marking pressure, dwell, and foil advance, the press may be preset to meet requirements of each job. Features include over-running clutch, and cross-feed foil advance for single color or zoned multicolor. Press is capable of stamping most thermosetting materials as well as plastics, fibre, wood, and coated metals.

Unit is 15 in. wide, 24 in. deep, 40 in. high, weighs about 370 lb, and requires connection to 75-110-psi air line and to 110-120-v line.

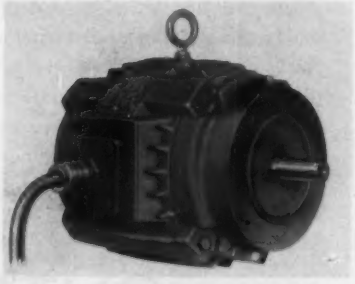
Acromark Co, 7-13 Morrell St, Elizabeth, NJ

Controlled Volume Pump For Barrel Head Mounting

Pump meters toxic or corrosive chemicals from upright, 55-gal barrels against pressures up to 100 psi.

Available in max capacities from 500 ml to 4 gal per hr, portable units have constant speed, 1/3-hp, 115-v, 60-c motors. Capacities are adjustable from zero to maximum. Repetitive pumping accuracy is ± 1%.

Milton Roy Co, 1300 E Mermaid Lane, Philadelphia 18, Penna

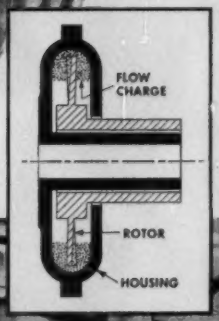


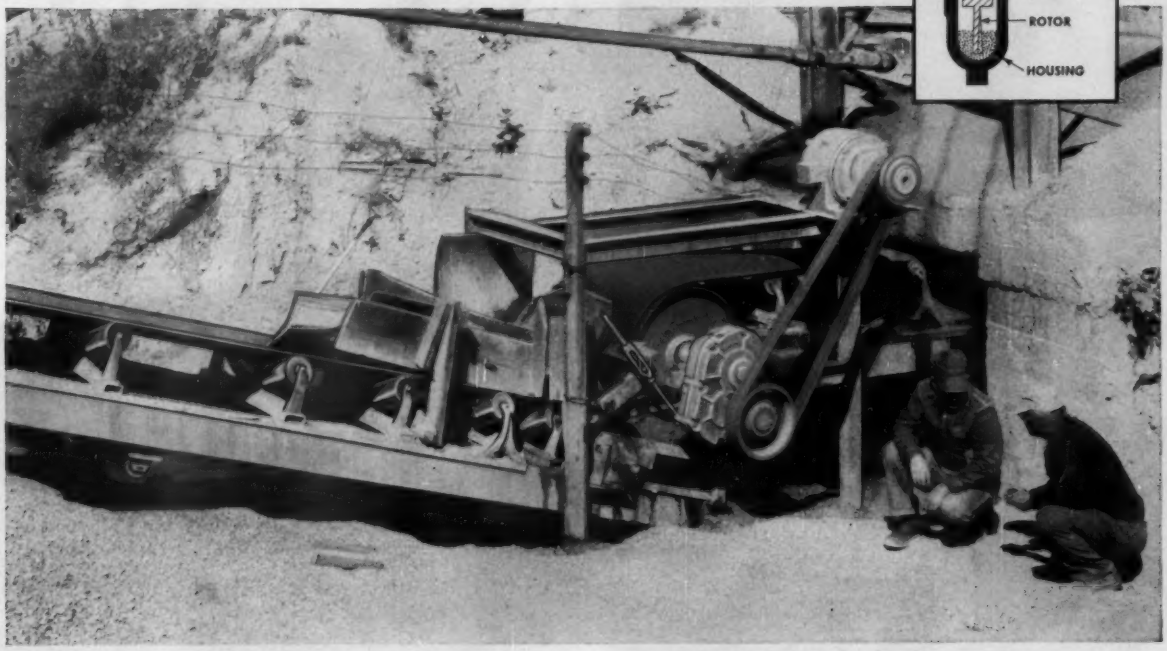
HP Varies With Air Velocity In Air-Over AC Motors

Totally enclosed air-over ac motor produces varying hp according to the velocity of the cooling air flowing

(Continued on page 194)

This new drive starts loads smoothly... with smaller motors ...and gives 100% efficiency at full load!





FLEXIDYNE

THE DRY FLUID DRIVE

This tunnel conveyor, 225 feet long, handles 500 tons of sand and gravel per hour—8 to 16 hours a day.

With Flexidyne, the motor picks up the load easily and smoothly. Power investment is reduced, power costs cut, maintenance simplified and conveyor belts are protected against breakage.

Flexidyne, the Dry Fluid Drive, is the *new* development that starts loads smoothly, that protects against shocks and overloads, that saves power and that gives 100% efficiency at full load!

The "dry fluid" in Flexidyne is heat treated steel shot. A measured amount, called the flow charge, is contained in the housing, which is keyed to the motor shaft. When the motor is started, centrifugal force throws the flow charge to the perimeter of the housing, wedging it between the housing and the rotor which transmits power to the load.

After a momentary slip between housing and rotor, the two become locked together and achieve full load speed without slip and at 100% efficiency during the running cycle. Changes in weather—hot or cold—inside or out—do not affect operation of Flexidyne.

Flexidyne is now available in 8 sizes—for use with electric motors and internal combustion engines from 1 hp to 300 hp. While each size is power rated, the flow charge can be varied at will to give tailor-made torque for your particular job. Write for Bulletin A-640.

DODGE MANUFACTURING CORPORATION
100 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in in your classified phone book, or write us.

DODGE
of Mishawaka, Ind.

Ready, Set, GROW...with

REVERE ALUMIN SHEET

Revere Aluminum Sheet Mill
Baltimore, Md.

COPPER ★ BRASS
18 01
REVERE
ALUMINUM

New Revere Aluminum Sheet Mill
Chicago, Ill.

You will find that Revere Aluminum Sheet passes smoothly and economically through your processes, that it brings to your products all the advantages you expect from fine aluminum.

Three Revere plants, located in the East, the Mid-West and on the Pacific Coast, can bring mill service and technical consultation close to your own doorstep. These plants will have the backing of Revere's primary aluminum operation, scheduled to begin production in 1958.

It will pay you to tie the growth of your business to the most dependable sources of supply—such as Revere, which is in aluminum in a BIG WAY. Revere Copper and Brass Incorporated. Founded by Paul Revere in 1801. Executive Offices: 230 Park Avenue, New York 17, N. Y.

Revere Aluminum Mill Products include coiled and flat sheet, both plain and embossed, circles, blanks, Tube-In-Strip, extruded products, seamless drawn tube, welded tube, rolled shapes, electrical conductors, forgings, foil and frozen food containers.

→ Projected for 1957: New Revere Aluminum Sheet Mill Santa Ana, Calif.

Why NEW "150" HYDROHONER Is Economical . . . Compact . . . Standardized

Basic Micromatic "150" Machine, suitable for both internal and external Microhoning.

Now, even manufacturers with limited capital can afford Microhoning . . . with all its benefits including efficient stock removal, accurate geometry and controlled surface finish. The new Micromatic "150" Hydrohoner is the answer!

Because it is standardized and produced in quantity, this quality machine is economical. (Special engineering is limited to tooling and fixturing.) The design and quality of the "150" assures performance equal to more expensive honing machines. It has a 12″ stroke and Microhones diameters up to 1½″ . . . yet requires just 34″ x 52″ of floor space.

The Micromatic "150" is ideal for the manufacturer with limited capital, short production runs or a need for standby equipment. Immediate delivery from stock on basic machines.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision"... available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

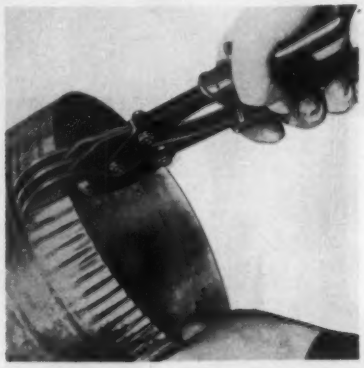
NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE_____ E

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

over motor's frame. Cooling effect allows increased power output without exceeding rated temperature rise of the motor. Line of motors features cast iron ribbed-frame construction, double-shielded ball bearings, and metered lubrication.

Available in new NEMA frame sizes from ½ to 30 hp, motors operate on 208-v network systems and are normally supplied in non-ventilated construction.

Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio



Compound Leverage Pipe Crimper

Model 500, with capacity up to 20-gage galvanized steel, has 1¼-in. blades, makes two crimps each time jaws are compressed.

Tool weighs approximately 1 lb, is made of abrasion-resistant steel, has plastic hand grips with stop posts to prevent slippage.

Niagara Machine & Tool Works, 683 Northland Ave, Buffalo, NY

BARREL CRADLE TRUCK No. 49 has curved top rails to prevent barrel-tipping, non-skid devices located directly forward of front wheels, and safety catch on nosepiece.—*Morse Manufacturing Co, 727 W Manlius St, East Syracuse, NY*

Electronic Indicator Measures To 0.00001 in.

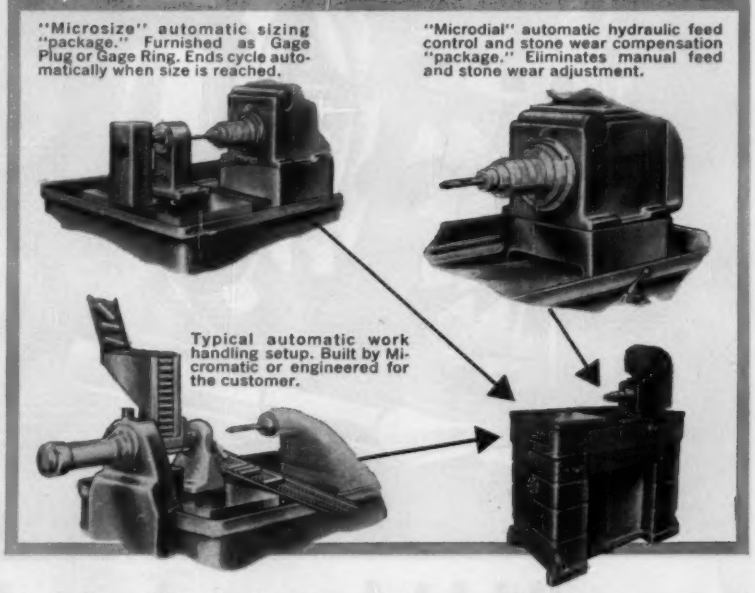
Model IA-515 Indi-Ac dimensional gage and comparator features three coded meter scales that simplify measurement of dimensional variations of from 0.00001 to 0.010 in. Range switch indicates high, medium or low range. Zero points and readings coincide on all scales without separate adjusting for each scale.

Minute changes in gage tip position are electronically amplified up to 10,000 times and read directly on the meter. Gaging pressure is approx ¾ oz. Lightweight amplifier has built-in compensation for voltage variations.

Cleveland Instrument Co, Inc, 735 Carnegie Ave, Cleveland 15, Ohio

ELEVATING TRUCKS in new Safeway line include fork, platform, drum stackers, straddle models. Max loads are 1000 lb for pedal-operated units, 1500 lb for battery-powered. Standard models lift up to 94 in. Bulletin HE-56—*American Pulley Co, 4200 Wissahickon Ave, Philadelphia, 29, Penna*

How NEW "150" HYDROHONER Can Be Automated to Any Degree . . . Easily . . . Economically


"Microsize" automatic sizing "package." Furnished as Gage Plug or Gage Ring. Ends cycle automatically when size is reached.
"Microdial" automatic hydraulic feed control and stone wear compensation "package." Eliminates manual feed and stone wear adjustment.
Typical automatic work handling setup. Built by Micromatic or engineered for the customer.

The basic Model "150" Hydrohoner is a new, standardized and economical Microhoning machine . . . priced for manufacturers with limited capital or relatively short production runs.

The basic machine features automatic stroking and hydraulic initial tool expansion and collapse. Various degrees of automation can be easily added at any time to the basic machine as required by individual manufacturers' needs. Micromatic "package units" which provide specific automation functions are illustrated. Design of this basic horizontal machine and its stationary bridge facilitate addition of these "package units". For complete automation of the "150" Hydrohoner, Micromatic will build automatic work handling devices or assist users in designing their own automation of work handling.

Send coupon for complete information.

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Are solid high-speed steel milling cutters obsolete?

If they are someone ought to tell our customers about it. They've asked us to produce so many styles and sizes that we finally went all the way and stock the most complete line available anywhere.

No, the solid high-speed steel cutters haven't been obsoleted by the carbides. When it comes to the smaller production runs and toolroom use, the solid steel cutters are *it*. Here, they'll perform more than adequately at the lowest possible initial tool cost. And they're much easier to maintain than the more costly carbide cutters.

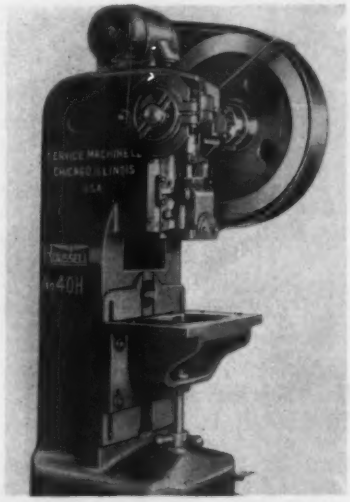
Even though Go & Go produces a lot of inserted blade cutters, we're just as proud of our extensive line of solid high-speed steel cutters. Every tool is engineered with the same care and over 38 years of milling cutter know-how goes into each and every one.

Want to see the extensive stock of standards available? Ask for Catalog F, it's free on request. Go & Go also designs and manufactures special milling cutters in quantity. Check one of our engineering sales representatives in principal industrial centers for details.

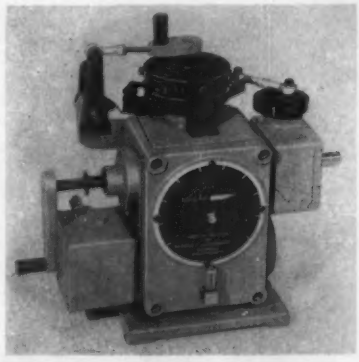
Go & Go

GODDARD & GODDARD COMPANY
DETROIT 23, MICHIGAN
Engineering and producing tools that Go & Go since 1917.

NEW SHOP EQUIPMENT



HORNING PRESS, Rousselle No. 40-H, handles operations such as forming, punching, and riveting hollow, odd-shaped or cylindrical works. Press has adjustable-bed table to accommodate dies and fixtures requiring large die space between bed and slide. Units of 5 to 40 tons are offered—*Service Machine Co, 2310 W 78th St, Chicago 20, Ill*

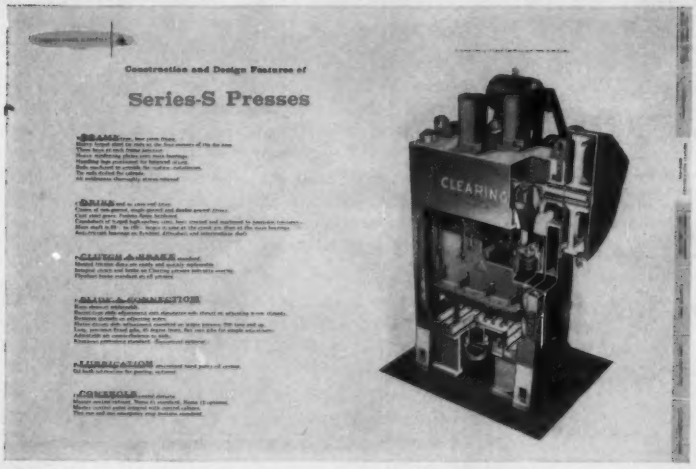


VARIABLE-SPEED TRANSMISSION, adjustable over a range of 8:1, can be adjusted either manually or automatically while unit is at stand-still or in motion. Transmission components run in oil and are completely enclosed. Optional spur, bevel, or worm gear reductions are available and may be installed in any of four positions or planes. Control can be electrical, mechanical, hydraulic, or pneumatic. Power is transmitted through multiple contact of driven and driving disks that are free floating on splined shafts —*Geo E Clentimack Co, Inc, 229 West St, North Attleboro, Mass*

(Continued on page 199)

what you should
know about

CLEARING
S-TYPE PRESSES


Construction and Design Features of

Series-S Presses

it's all in this **new**
CLEARING CATALOG

Here are all the vital statistics of Clearing's line of crankshaft Series-S presses. These presses give you the capacity and rigid construction for all types of drawing and heavy blanking operations, the precision that's required for progressive die work and lamination production. All the facts on these moderate priced, versatile machines are given in a colorful new 48 page catalog—complete specifications and full, accurate descriptions of construction and features.

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Twin Screw Knee Support

Think it over... twin screw knee support is the one really new basic advancement in knee type milling machine design in years. And only Kearney & Trecker new TF Series machines have it!

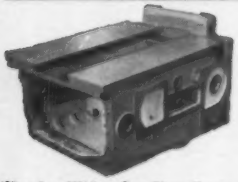
Here's why it makes sense.

Because the *twin screw* design distributes most effectively the weight of much larger, heavier knees, saddles and tables, it fulfills today's requirements for higher speeds, feeds and power — greater machine capacity. What's more, this *balanced design* substantially increases stability under heaviest loads... offers greater resistance to torsional thrust under all cuts... divides the wear factor in half, thus assuring greater, longer-lasting accuracy.

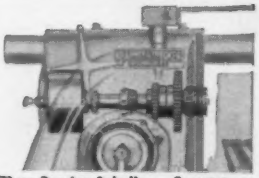
Kearney & Trecker's feature-packed TF Series line of general production machines is available in five sizes — No. 2 to No. 6, from 10hp to 50hp in Plain, Universal and Vertical styles.

Why take less than the latest when you want new milling machines? You can get all the facts on the new TF's from your Kearney & Trecker representative, or write direct to Kearney & Trecker Corp. Mail coupon for new catalog with details on TF Series machines.

5 more reasons why TF Series milling machines are way out front in rigidity

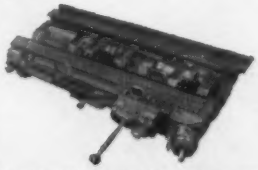


Heavier, Wider, One-Piece Knee — The TWIN SCREW arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . lasting accuracy . . . substantial reduction of way and gib wear.



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, a train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life, better finish and quieter operation.

Double "Vibra-Void" Overarms — Two solid steel bars, mounted completely through column, void vibration at source, afford more rigidity and resistance to deflection than any other type support. Design also greatly simplifies changing of arbors and cutters.



"Fron-Trol" Operating Convenience — Front-mounted controls include feed selection, Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, table handwheel, saddle clamping gib and backlash eliminator. Machines have 2" dia. table feed screw.

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

KEARNEY & TRECKER
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KEARNEY & TRECKER CORP.
67?? W. National Ave., Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on new line of TF Series Plain, Universal and Vertical milling machines.

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Title.....
Company.....
Address.....
City.....Zone.....State.....

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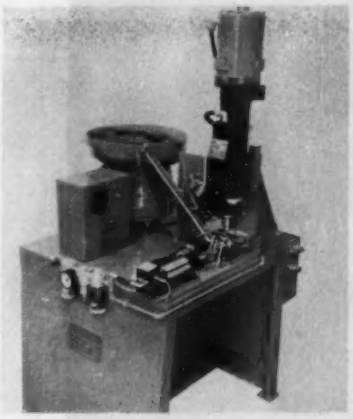
NEW SHOP EQUIPMENT



AUTOMATIC TAPPING MACHINE for small parts has production capacity of 1500 pieces per hr. Unit consists of vertical tapping unit, vibratory feeder, gravity track, escapement, work feeder, and ejector mechanism—*Automation Development Corp, 135 Reynolds Rd, Mentor, Ohio*

BENCH MARKER, Pneumark Model 10-T, is designed to stamp lettering or numbers into steel parts. Press is operated by solenoid-controlled valve, which opens only when both hand-control buttons are pressed at once. Solid-steel base is drilled and tapped with holes for fastening fixtures or nests. Lettering tools use 1-in.-round shank — *Geo T Schmidt, Inc, 4100 Ravenswood Ave, Chicago 13, Ill*

Scrap choppers, Models 100, 200, and 300, are available with heavier duty bearings, better lubrication systems, and improved steel in blades.

Durant Tool Supply Co, I-15 Thurbers Ave, Providence 5, RI

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rotary tools

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All Ford files H. S. S. and carbide cutters are *precision machine ground* . . . which insures that tooth spacing is uniform and relief angles are constant on each tool. Ford files are handcut by precision craftsmen. On your job, that means more parts per grind. So you save labor on grinding and tool changing. You save on replacements. You save on downtime. What's more, there's less time per part, more parts per hour. In 7 shapes . . . cutting head sizes from ⅛" to 1" diameter, up to 1⅜" in length. All standard, and *available* in H. S. S. or solid carbide.

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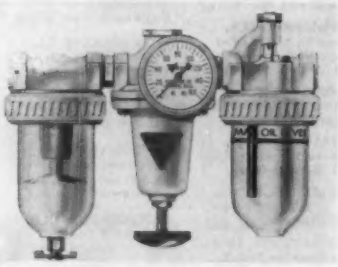

FILTER-REGULATOR-LUBRICATOR is a combination unit which processes air supply to pneumatically operated equipment. Sizes currently available are ¼, ⅜, and ½ in. Filter has contoured air passage which imparts a downward spiral motion to incoming air, so that foreign matter is thrown to sides of bowl and drained off—*Watts Regulator Co, Industrial Div, Lawrence, Mass*

INTERNAL MEASURING INSTRUMENT, model N-7, is designed for inspecting internal diameters of ring gages and other parts for size, taper, bell-mouth and out-of-roundness. Capacity is from 0.370 to 12 in. with vertical capacity to 1½ in. Special gaging arms will give gaging range of 0.240 to 12 in. with vertical capacity to 1 in. Previously announced Sheffield Electrojet transducer pickup and Accutron amplifier are used—*Sheffield Corp, Dayton 1, Ohio*

Starrett Vernier Caliper Has Easy-to-Read Graduations

Master-Vernier caliper, No. 123, has long 50-division vernier scales with widely spaced graduations which simplify setting and reading without magnifier. This feature permits having half the conventional number of graduations on the bar. Open-face design also permits placing both the

Tear this chart out and preserve it

YOUR GUIDE TO COLUMBIA HOT WORK TOOL STEEL GRADES

TYPE AND GRADES	DESCRIPTION	HARDENING RANGE	QUENCH	TEMPERING RANGE	USEFUL HARDNESS
T1 — CLARITE HW	Full tungsten hot work steel with modified carbon and vanadium for highest resistance to softening at elevated temperatures with best wear resistance and medium toughness.	2100° F. to 2250° F.	Oil or Salt Bath	1050° F. to 1250° F.	58/52 Rc
H24 — FORMITE NO. 3	A high tungsten hot work steel with good heat resistance to softening and wear, good toughness.	2000° F. to 2200° F.	Oil or Air	1050° F. to 1250° F.	56/48 Rc
H21 — FORMITE NO. 2	Reduced tungsten hot work steel with good resistance to softening and wear and high toughness.	2000° F. to 2200° F.	Oil or Air	1100° F. to 1250° F.	54/42 Rc
M10 — MOLITE HW10	A high molybdenum 2% vanadium steel with modified carbon for high resistance to softening and good wear resistance with high toughness.	1800° F. to 2100° F.	Oil or Air	1100° F. to 1250° F.	56/48 Rc
H13 — VANADIUM FIREDIE	Air hardening chromium molybdenum 1% vanadium for die casting aluminum, may be water cooled.	1825° F. to 1900° F.	Air	1000° F. to 1200° F.	52/38 Rc
H12 — ALCODIE	Chromium molybdenum tungsten vanadium air hardening hot work steel, resists softening with good resistance to wear and heat checking	1825° F. to 1875° F.	Air	1000° F. to 1200° F.	52/38 Rc
H11 — FIREDIE	Chromium molybdenum with 1/2 % vanadium air hardening type with widest range of uses, good resistance to softening and wear with high toughness and may be water cooled.	1800° F. to 1850° F.	Air	1000° F. to 1200° F.	52/38 Rc

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILLINOIS

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Los Angeles 22, 6955 E. Bandini Blvd., Phone RAymond 3-4684
Milwaukee 4, 426 S. Sixth St., Phone BRoadway 6-0255
St. Louis 13, 5118 Easton Ave., Phone FOrest 1-0641

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TOOL COLUMBIA STEELS

COLUMBIA TOOL STEELS

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Richard Leitner, Production & Dist. Mgr. of Abbott Laboratories, Oak Ridge, Tennessee, says:

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"In a hospital 700 miles from Abbott Laboratories' Oak Ridge plant, radioisotope experts have scheduled use of a radioactive drug . . . a drug whose radioactivity lasts only a limited time. A drug prepared by electronic bombardment in the huge atomic pile at Oak Ridge near Knoxville, Tenn.

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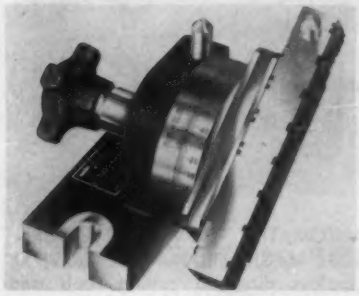
inside and outside vernier scales on same side of tool.

All reading surfaces are finished in satin-chrome. Gage is available in 12- and 24-in. sizes graduated to 0.001 in. to read the full length.

L S Starrett Co, Athol, Mass



COMBINATION ANGLE DRESSER AND TOOLHOLDER, Model G-2, has vernier scale from 0 to 180° with accuracy guaranteed within 2 min of 1°. Small jobs to be milled, drilled, or tapped at any angle can be set up quickly. Tool is priced at $87.50, including cutting diamond—*Rothfuss Tool Co, Box 2804, Providence 7, RI*

Brakemotors that stop instantly and hold heavy loads are available in all types of enclosures. Motors feature torque ranges of from 3 ft-lb to 345 ft-lb, one-piece molded friction linings, and one-operation torque setting. In event of power failure or low voltage, "dead man" operation sets and holds load until normal operation is restored.

Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio

Self-sticking numbers and letters, mounted on dispenser cards, are available in six sizes from ½ to 5 in. high; alphabet, numbers 0 through 9, and dashes. Plastic impregnated cotton cloth tape withstands temperatures from +300 to –300 F. Bulletin 165.

W H Brady Co, 727 W Glendale Ave, Milwaukee 9, Wis

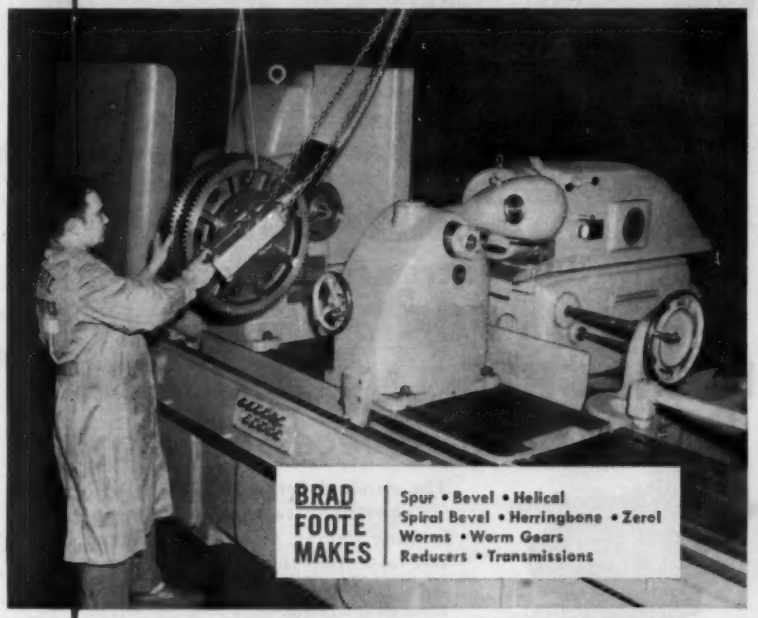
Shaped wire and rod of Monel, Inconel, Inconel X, Nickel and Techalloy stainless, and other special heat and corrosion-resisting alloys are available as result of new combination drawing and rolling process. Variety of shapes can be specified; max dimension is ½ in., sizes down to 0.002 in. have been made.

Techalloy Co, Rahns, Penna

SPECIAL MACHINES —MEN

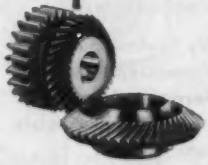
2 Reasons Behind Brad Foote Quality

• The craftsman shown below is loading a gear into one of the latest additions to BRAD FOOTE'S long list of special-purpose machines. The only one of its kind in existence, this new shaver can straight or crown shave gears up to 51″ in diameter. Normally accommodating gears with shafts up to 142″ between centers, it can handle even longer shafts by using special journals. Specially designed, the new machine will shave either internal or external gears.



• Costly special machines such as this are important in providing the extra quality at lowest cost which is the hallmark of BRAD FOOTE gears. But these are only part of the story. Even more important, perhaps, are the men who man these machines—experienced craftsmen with long experience in producing gears to meet the most exacting and specialized requirements.

• BRAD FOOTE'S facilities are at your disposal whether you need one gear or a long production run. We would sincerely appreciate an opportunity to discuss your requirements or quote on your specifications. Your inquiry will receive prompt attention.



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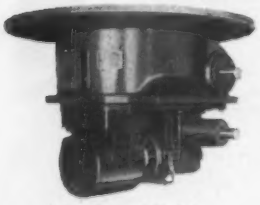
Up to 30,000 Pieces per Hour



Standard Table and Power Section

Stand and Auxiliary Tool Mounting Plates

The standard Ferguson Intermittor is a *must* for operations such as machining, joining, forming, staking, piercing, assembling, testing and inspection that require a combination of high speeds, long dwell or work time, and smooth indexing.

There is a standard Intermittor for almost every application, offering a choice of stops, dial size, degree of movement; and a table for either extreme precision or high torque usage. Seldom do you have so much selection in a line of standard production machinery . . . with all of the benefits of standardization PLUS many of the advantages of custom designs! The Intermittor operates at speeds far greater than those possible with other types of index tables. The special acceleration characteristics of the FERGUSON ROLLER GEAR DRIVE insure smooth starting and stopping with little shock and vibration, at speeds up to 500 indexes per minute.

Save design time, simplify tooling, improve product quality and cut maintenance costs to rock bottom with the Ferguson Intermittor . . . the "Packaged" precision index table for high speed production.

HIGH SPEED INDEXING • STANDARD TRANSFER MACHINES • AUTOMATIC TOOLING

FERGUSON MACHINE CORPORATION OF INDIANA

Roller Gear Division, Dept. MI-4 • P.O. Box 5841, St. Louis 21, Mo.

AUTOMATIC COMMUTATOR-TURNING MACHINE, Model CTM-2000, employs diamond cutting tools and turns out 500 to 700 finished commutators per hr. Rough- and finish-turning can be performed simultaneously by using two diamond tools. Machine can be adjusted to turn parts up to 2-in. dia and 2-in. length with a tolerance of 0.0003 in. and with a 15 mu-in. surface finish—*Motor-Mation, Inc, 116 W 9th St, North Canton, Ohio*

Self-locking socket setscrew is designed so that screw threads can be wedged without damage, preventing loosening of screw through vibration. Reusable fastener can be loosened by wrench and reset in any desired position.

Sta-Loc Inc, 1513 Broadway, Rockford, Ill

Double-cut snip No. 55 has lower blade ground to a triangular reamer point for making starter cut. Female blade is serrated to minimize back thrust. Handle is hot-dipped Plastigrip.

Peck, Stow & Wilcox Co, Southington, Conn

Synthetic detergent, Kenvert Sluff-Off, removes buffing compounds from ferrous or nonferrous metals; compound is said to slough off in sheets. Product, to be used in steel tanks with steel coils, is furnished in 5-gal pails.

Conversion Chemical Corp, Rockville, Conn

Cylinders in 1½ and 4-in. bore sizes have been added to the Economair series, designed for air or hydraulic service to 200 psi.

Modernair Corp, 400 Preda St, San Leandro, Calif

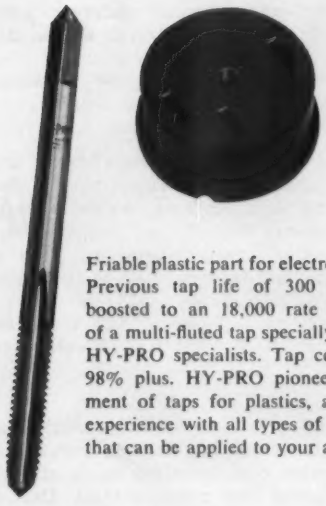
HY-PRO specialists deliver

savings as high as 98%

with taps of special design

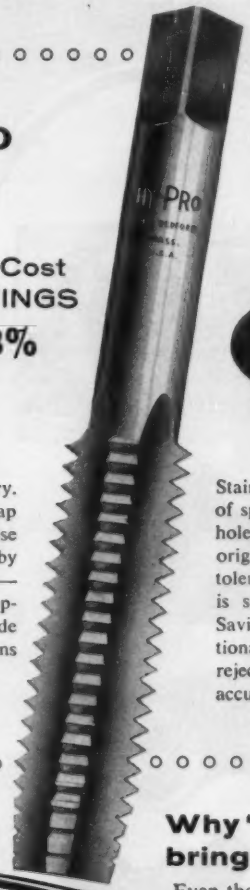
While HY-PRO standard taps meet most production needs, you can rely on HY-PRO specialists to tell you when it will pay you to use a tap of special design. You can also rely on the design they develop to deliver maximum savings, — in tap expense, in production time. The proof is in the records of hundreds of jobs like the two described below. Why not let HY-PRO engineering ability and experience uncover comparable savings for you?

from 300 to 18,000 holes per tap...



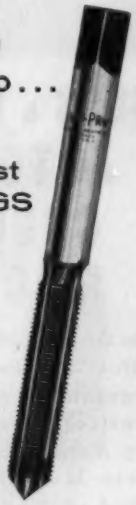
Tap Cost SAVINGS **98%**

Friable plastic part for electronic industry. Previous tap life of 300 holes-per-tap boosted to an 18,000 rate with the use of a multi-fluted tap specially designed by HY-PRO specialists. Tap cost saving — 98% plus. HY-PRO pioneered development of taps for plastics, and has wide experience with all types of compositions that can be applied to your advantage.



from 100 to 800 holes per tap...

Tap Cost SAVINGS **88%**



Stainless steel aircraft part. HY-PRO tap of special design raised tap life from 100 holes-per-tap to 800. Threading with the originial tap was rough, varying over tolerance. With the HY-PRO special, it is smooth, clean, consistently Class 3. Savings in tap cost — 88%; plus an additional big saving gained by eliminating rejects previously scrapped because of inaccurate threading.

HY-PRO

REG. U. S. PAT. OFF.

The Tap Engineering Specialists

Why "special" tap development brings you better "standards"

Even though you never need "specials", you benefit by HY-PRO leadership in special tap design. The intensive research and testing involved is all reflected in constant improvement of HY-PRO standard taps. It costs nothing to consult HY-PRO specialists, and they can often point out opportunities for substantial savings, even in tapping operations you've considered satisfactory. What's your problem? Write: Dept. B.

ASK FOR STOCK LIST OF SPECIAL TAPS AVAILABLE FOR IMMEDIATE DELIVERY

CALL YOUR LOCAL **HY-PRO DISTRIBUTOR** FOR STANDARD TAPS FROM STOCK

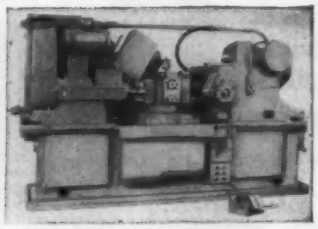
HY-PRO TOOL COMPANY · NEW BEDFORD, MASS., U. S. A.

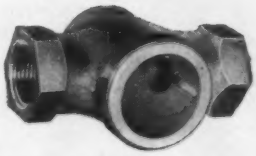
...and parts are finished without rehandling on

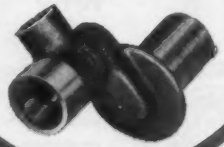
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.







A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

NEW SHOP EQUIPMENT

Indicator for quick readings of variables can scan up to 48 remote points. It is equipped with numbered push-button switches on front of case. Revolving drum scale has calibrated length of over 26 in. Offered primarily in resistance thermometer and pyrometer models, it can also be supplied for measuring other variables. Bulletin P1245A.

Bristol Co, Waterbury 20, Conn

Phosphating compound, Oakite Crys-Coat No. 47, cleans and phosphates iron and steel in spray washing machines. Material imparts coating of 80 to 120 mg in a brief spray application.

Oakite Products, Inc, 124 Rector St New York 6, NY

Machine key stock bars are available in the 7-11 Mak-A-Key Kit containing seven bars of different sizes which may be filed to fit eleven different keyways.

DeVan-Johnson Co, 500 Rathbone Ave, Aurora, Ill

Combination ramp-dockboard, all-magnesium Model RD, is built in two detachable sections; dockboard section can be used independently for normal loading operations. Unit is available in capacities up to 12,500-lb axle loading.

Lite-Line Industries Div, Copperloy Corp, 4111 Brookpark Rd, Cleveland 24, Ohio

Lens cleaning station (21961) consists of wall-mountable tissue dispenser, 8-oz spray-top bottle of anti-fogging lens cleaning fluid. Unit is shipped with two boxes of tissues.

US Safety Service Co, 1215 McGee St, Kansas City, Mo

Steel 4-post drafting tables are available in variety of combinations, with or without tool drawer, shallow drawer, auxiliary drawer unit, metal plan file, or with drawing top and reference top combination.

Mayline Co, Inc, Sheboygan, Wis

Cooling compound for cutting and grinding aluminum reportedly will not stain or discolor. International Compound 1231-A is said to possess excellent lubricating properties which protect both the work and moving parts of the machine.

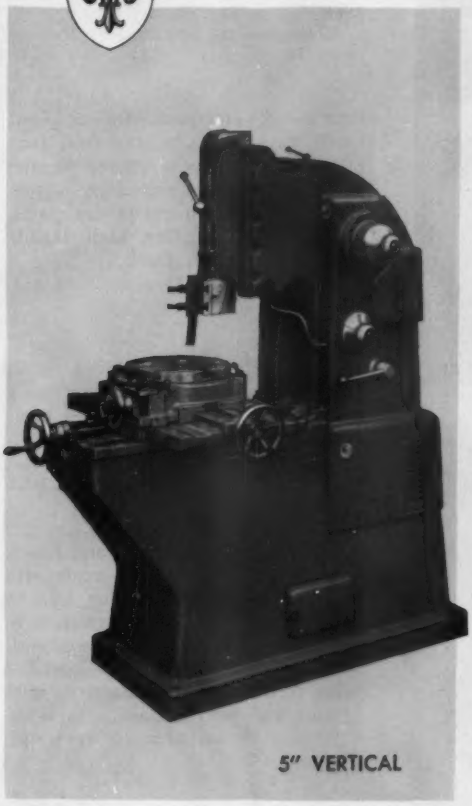
International Chemical Co, Dept 350, 2628 N Mascher St, Philadelphia 33, Penna

HORIZONTAL AND VERTICAL

SHAPERS

BUILT TO U.S. STANDARDS BY EUROPE'S FINEST CRAFTSMEN

The finest old world skills build life-long precision into these shapers assuring dependable production to the most exacting tolerances. Sound engineering standards and modern design are combined in these shapers offered at low initial cost.



5" VERTICAL

Chomienne Vertical Shaper—
5" stroke, with 12½" rotary table, automatic lubrication, power feed. A real time-saver for accurate machining of irregular shapes and forms. Low initial cost.

ES-26 UNIVERSAL

VMA Shapers—standard and production models . . 14" to 28" stroke . . automatic lubrication, table power rapid traverse.

austin INDUSTRIAL CORPORATION

76F MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

HORIZONTAL AND VERTICAL MILLING MACHINES • POWER HACKSAWS

FAST SERVICE AND PARTS AVAILABLE FROM MAJOR CITIES, WRITE FOR CATALOGS

with **LIPE Automatic**
MAGAZINE LOADING BAR FEEDS"

says Factory Superintendent Dan Thomas*

Our production figures ran all over the chart when we were using stock-feeding devices equipped with feed-fingers. In addition to tricky set-ups and frequent re-sets, we lost a lot of polished stock which had to be scrapped or refinished when scratched or marred by feed-fingers. Operators suffered fatigue and strain trying to stay on top of these mechanical "prima donnas." Production suffered from the slow-downs resulting from all these factors.

Our first test run of a Lipe A.M.L. Bar Feed proved that every one of these "bugs" could be eliminated—permanently. It fed stock continuously . . . without feed-fingers . . . with no repeat motion for feed-outs . . . no down-time for adjustments or remnant removal. There was no cutting air: From 7:30 to 4:00 every turn of the spindles produced *work* . . . at a day-in-day-out delivery of 58% higher production! Our entire department is now equipped with Lipe A.M.L. Bar Feeds.

WRITE or WIRE for a FREE Lipe Sales Engineering estimate of production increases, savings and amortization time of Lipe A.M.L. Bar Feeds in your production layout.

*Photographer's models and pseudonyms used to protect company identity and confidential information.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N.Y.

BAR FEEDS • HEAVY-DUTY AUTOMOTIVE CLUTCHES • PORTABLE POWER HACK SAWS

NEW SHOP EQUIPMENT

Portable electronic counter consists of input amplifier, pulse shaper, plug-in electronic decade unit, and 5-digit mechanical register. Capable of 12,000 counts per minute, it operates on 105-125 v ac.

Performance Measurements Co, 15301 W McNichols Rd, Detroit 35, Mich

Cold punching laminate, Insurok XT-896, is said to punch clean and sharp at average room temperatures, to have low moisture absorption and dielectric loss at high frequencies. excellent insulation resistance.

Richardson Co, 2737 Lake St, Melrose Park, Ill

Iron powder electrode, Murex Speedex R, is said to be the first iron powder formulation offered in the E-6010 class. It is especially adaptable for welds on machinery parts, and many low alloy high tensile steels up to ¼ in. thick.

Metal & Thermit Corp, 100 Park Ave, New York, NY

Boarhide industrial gloves with seamless palm and full leather wing thumb are available in three basic styles: safety cuff, gauntlet, and knit-wrist.

Wearhide Glove Co, Rockford, Mich

Treads for stair landings and floors, designated Safestride, are made with heavy-duty aluminum alloy base in widths of 3 and 6 in., furnished in length as required. Put down in multiple sections, they can be installed with screws or, on masonry, with screws and lead expansion shields.

Wooster Products Inc, 100 Spruce St, Wooster, Ohio

Alcoa Soldering Sheet, zinc-clad aluminum alloy, is fabricated with one or both sides clad, and in coil or flat sheet form. Product is especially designed to facilitate soldering of heat-exchanger equipment.

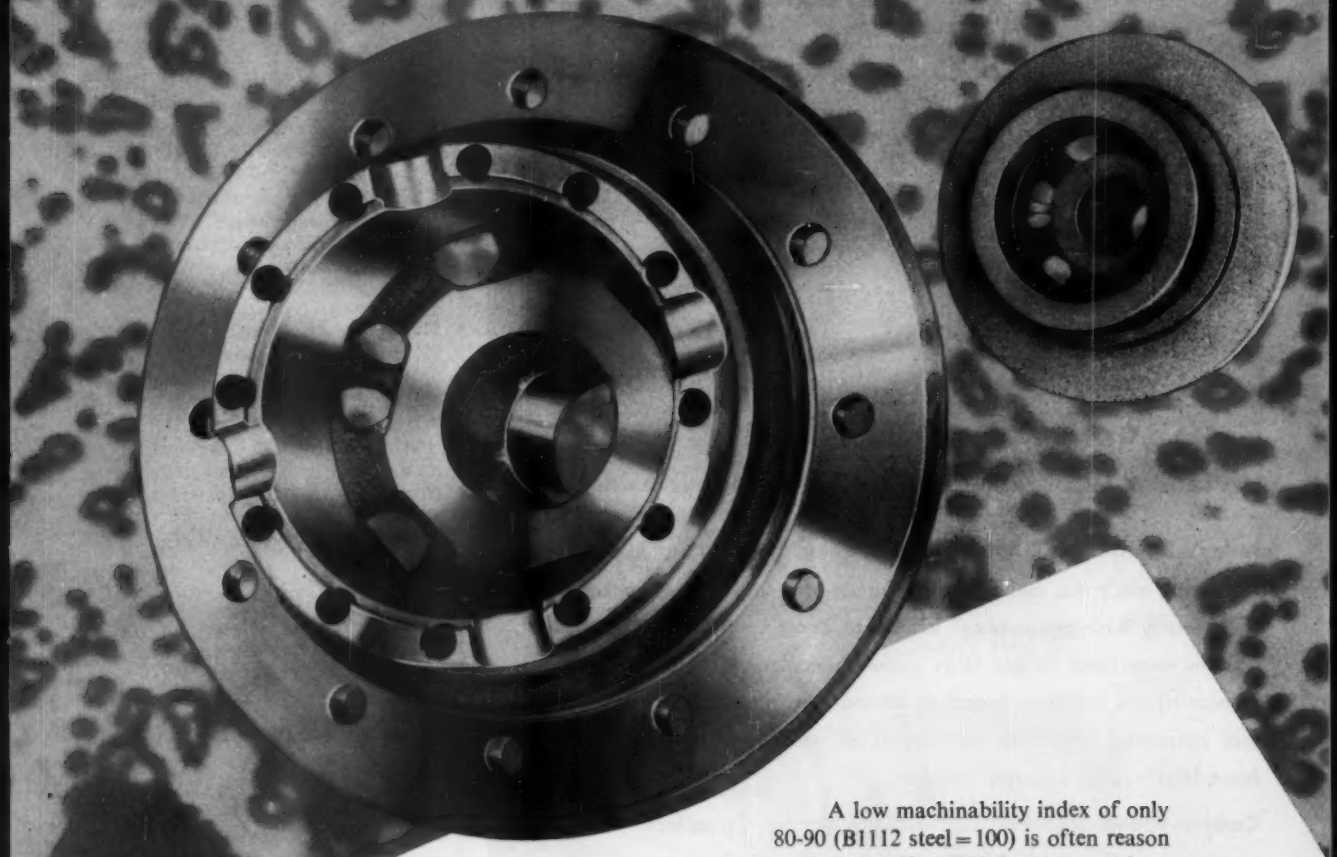
Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Penna

Air-gage spindles for any standard air-gage instrument, regardless of make or model, are offered from stock. Spindles are available in steel, chromium, and carbide; in through-hole, counterbore, and blind types; and in sizes ranging from 0.275 to 3 in. in dia.

Dearborn Gage Co, Air Gage Div, Dearborn, Mich

it's only part of the HTM story...*

MACHINABILITY

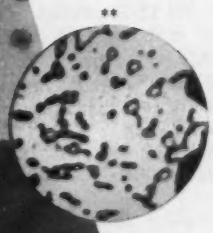


A low machinability index of only 80-90 (B1112 steel = 100) is often reason enough to specify HTM for your product.

But HTM castings don't stop there. Other "plus" advantages are high ultimate strength . . . resistance to wear under heavy loads and at high speeds . . . excellent non-seizing properties. In addition, they can be air or liquid quenched . . . can be smooth finished.

Don't overlook the many advantages of HTM metal. It can increase the performance and saleability of your product.

XX-2000



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NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Established 1868 • Cleveland 6, Ohio

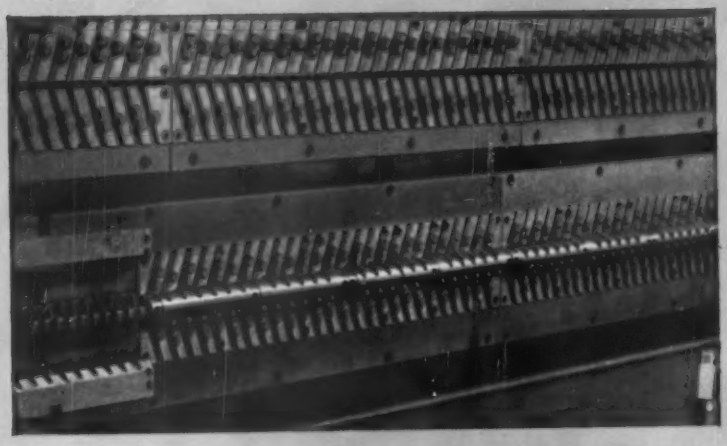
The nation's largest independent producer of malleable and pearlitic malleable

*Hi-Tensile (Heat-Treated) Malleable

**HTM-228 metal, liquid quenched, x2000, etched

watch your
production curve
ZOOM UPWARD
with the use of

LAPOINTE -BROACHES
CARBIDE TIPPED



Today's remarkable chatterless broaching speeds, on Lapointe Broaching machines, make possible the use of carbide-tipped broaches . . . usually with phenomenal success in boosting production. That was the experience in one large automobile plant, using those *good* carbide-tipped Lapointe broaches, shown here mounted on a double ram horizontal broaching machine. They are broaching automotive main bearings in "clusters" of five.

Carbide-tipped broaches are used on intricate "pine-tree" forms, as well as on flat slab type broaches. Sometimes carbide is used only on the finishing section of the broach.

New booklet available
"HOW TO CARE FOR BROACHING TOOLS"
Profusely illustrated, it is a complete manual describing the proper care of broaches while in use on the broaching machine and in handling broaches throughout the plant, as well as giving many helpful tips on regrinding of broaches.
Ask for Booklet No. 2.

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS — U. S. A.
In England, Watford, Hertfordshire
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

LAPOINTE-BROACHES, Electrolized increase broach life between grinds from 2 to 10 times.

LAPOINTE
known to be the best in
BROACHING

NEW SHOP EQUIPMENT

Dip compounds in Unichrome series, used as finish coatings in zinc and cadmium plating operations, are offered in four types: Dry Dip Compound 1085 gives a bright, clear coating to zinc plate and is suitable for products plated in bulk; Dip Compound 1090 is similar to Compound 1085, but is furnished as a liquid concentrate; Dry Dip Compound 1084 and its liquid version, No. 99, are especially adapted to finishing cadmium-plated parts, but can also be employed with zinc plating.
Metal & Thermit Corp, Rahway, NJ

Boring bars, Styles KA and KB, are designed for use with turret lathes, and feature throwaway button inserts. Tools are available from stock in 6 sizes in each style. Style KA, without lead angle, is used for boring to a square shoulder. Style KB has a 15° lead angle for straight through-boring operations.
Kennametal, Inc, Latrobe, Penna

Single-dip brightener, Kenvert 27, is designed to passivate and give a uniform appearance with brightness to cadmium-plated work where brighteners are used in the bath. No special ventilation is required for its use, and it operates satisfactorily from 65 to 75 F in either manual or automatic cycles.
Conversion Chemical Corp, Rockville, Conn

Cold degreasing solvent known as Klearall 95 is now supplied based on new formulation. Solvent reportedly gives better degreasing action, increased recovery rate and high stability. Used in conveyorized cold degreasing operations or in single dip tanks, solvent requires no water or solvent rinses, leaves no oily residue, is non-explosive and noncorrosive. It is available in standard 54-gal and 5-gal drums and in 1-gal case lots.
Octagon Process, Inc, 23 Bank St, Staten Island 1, NY

Thin-wall welded tubing, formed and welded from high-tensile, cold-rolled alloy strip in continuous lengths to 200 ft, is offered in stainless steel, carbon steel, titanium, brass, bronze, and other weldable alloys. Wall thicknesses are graduated from 0.005 in. for ¼-in.-OD to 0.015 in. for 1¼-in.-OD.
Universal Tube Corp, 2133 S Kedzie Ave, Chicago 23, Ill

Barrel finishing abrasive called Tumblex S comes in form of abrasive spheres. Spheres are made of Alundum aluminum oxide abrasive, and are suited for finishing of intricate shapes such as finished tubing, coil springs, scissor handles, bearing retainers and pump bodies. Spheres come in five diameters and reportedly are exceptionally dense and long lasting. Parts may be sent to company's Sample Processing Lab for testing.

Norton Co, Worcester 6, Mass

Solid carbide drills and reamers have been added to company's Golden Circle line of tools. Twist drills range in size from No. 60 wire gage to ½ in. in dia, and reamers from 0.050 to ¾ in. Tools are recommended for use in plastics, cast iron, and non-ferrous metals.

Elgin National Watch Co, Abrasives Div, Elgin, Ill

Enclosed limit switch for industrial control, limit, and safety applications is called the Licon Type 30 Switch. Components available, including three actuators and three housings, can be interchanged to form 16 types of switches.

Licon Switch Div, Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill

Soft-faced hammer known as Hefty Hammer is made of an aluminum alloy and has a 13% elasticity factor. Aluminum reportedly will not chip, mushroom, harden or shear, and the hammer can be dressed over and over again. Tool is suited for positioning of heavy dies, driving gear arbors, or opening and closing jigs, and is available in two types of aluminum—soft and super soft—and in eight sizes from ½ to 5 lb.

Eclipse Pattern Works, 31 Elberta Rd, Painesville, Ohio

Base plates for company's scrap choppers (AM—Feb 25, '57, p220) elevate choppers to stock line level of larger die sets in punch presses. They provide for a 2½-in. common stock line, and come in three sizes for the three sizes of choppers, 3, 6 and 12 in.

Jaco Devices, Inc, 90 High St, Hingham, Mass

MESSAGE from the "NO" men of Laminated Shim Company

You lose NO time when you use LAMINUM SHIMS...

NO machining!

NO grinding!

NO counting!

NO stacking!

NO miking!

...and NO dirt between layers—ever!

LAMINUM

SURFACE BONDED... THEY peel FOR ADJUSTMENT

Laminated Shims of LAMINUM now available in

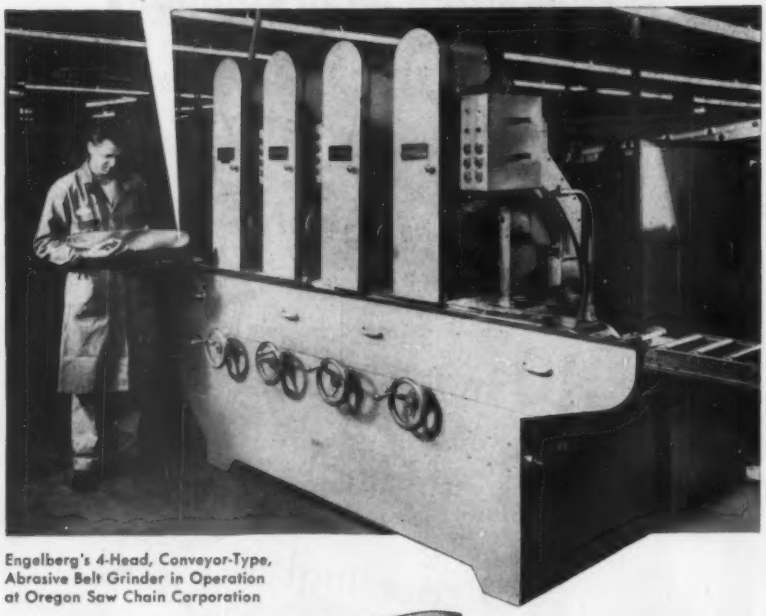
STAINLESS STEEL with laminations of .002" or .003"	ALUMINUM with laminations of .003" only
BRASS with laminations of .002" or .003"	LOW CARBON STEEL with laminations of .002" or .003"

LAMINATED SHIM COMPANY, INC.

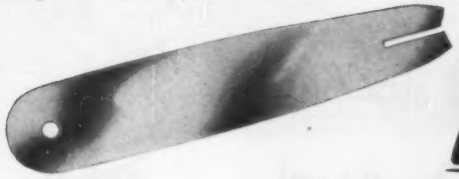
Shim Headquarters since 1913

3104 Union Street, Glenbrook, Conn.

HOLDS .001" TOLERANCES BETTER THAN OTHER GRINDERS TESTED... COSTS LESS: PRODUCES MORE



Engelberg's 4-Head, Conveyor-Type, Abrasive Belt Grinder in Operation at Oregon Saw Chain Corporation



Finished to .001" T.I.R. in one pass by Engelberg 4-head, conveyor-type, abrasive belt grinder.

ACTUAL TESTS PROVE PRODUCTION PERFECTION

After a nationwide tour testing grinders of various makes and kinds, the Oregon Saw Chain Corporation bought an Engelberg #680, 4-head abrasive belt grinder. Improvements in product and production have more than offset the investment, the Company says.

The Engelberg #680 provides through-feed as against the reciprocating feed of the surface grinder. It produces continuously with no down cycles for loading and unloading. And it holds a total-indicator-reading tolerance of .001", better than any other grinder tested. Rejects run less than 1%.

Chain saw bars, heat treated to 42 Rockwell "C" hardness, are finished in one pass. Normal operation calls for the removal of .005" by the four heads at a rate of 10'/min.

ENGELBERG Abrasive Belt Grinders

are available with 1 to 6 grinding heads. Send a sample part for cost-and-time-savings estimate... or an Engelberg Production Engineer will be glad to call. No cost. No obligation.

ENGELBERG

HULLER CO., INC.
184 Seneca St., Syracuse, N. Y.

to operate in all positions on ac or dc. Said to be particularly useful for welding mild steel to medium carbon and low-alloy steels, electrode is recommended for general use.

Air Reduction Sales Co., 150 E 42nd St, New York 17, NY

Instrument cleaning solution, nontoxic Power Nofome, is designed for delicate and intricate metal parts and components. Flash point is 100F, TCC. L & R rinsing solution, used as a follow-up, dissolves the cleaner, gives a brilliant finish to the parts.

L & R Manufacturing Co, 577 Elm St, Arlington, NJ

Press-Rite presses are now available with LH flywheel mounting providing more flexibility for switching from manual to automatic feeding. Mounting can be furnished on all air clutch models 10 ton and larger.

Press-Rite Div, Sales Service Machine Tool Co, 2363 University Ave, St Paul, Minn

Corners have been developed that are adjustable to 180° turn on a 5-in. radius for horizontal and vertical turns to 128°. Units are used in conjunction with continuous Conveyor-A-Series consisting of link chain moving in steel tubes.

Chain-O-Flex Corp, 3334 Lincoln Ave, Franklin Park, Ill

Hand and power hacksaw blades in all standard specifications, both regular and HSS, have been added to Heller Tool products. Also available in the new "Job-Tempered" line are hard edge metal cutting bandsaws, and some 1300 stock sizes of oil-hardening and air-hardening flat ground die steel.

Heller Tool Co, Newcomerstown, Ohio

Industrial truck, Automatic Transporter, (AM—May 21, '56, p182) is available with battery and battery-charger unit which can be plugged into any 115-v, 60-c ac line. Fully discharged battery can be recharged in 10-16 hr.

Automatic Transportation Co, Div of Yale & Towne Mfg Co, 149 W 87th St, Chicago 20, Ill

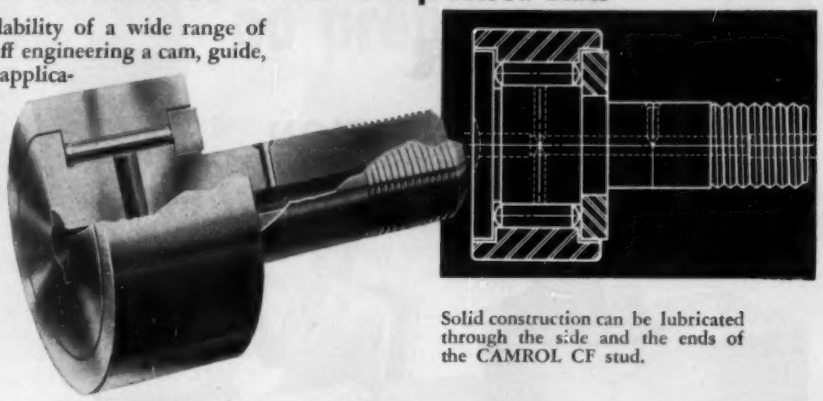
Chain hoist designated Type C Pull-A-Way is available in three capacities: 1½, 3 and 6 tons. Standard lift on all models is 5 ft. Double

BEARING TIPS by McGill

For convenience, with savings in time and cost

Use McGILL® CAMROL Cam Followers instead of improvised units

Simplification of design with availability of a wide range of standard bearings takes the strain off engineering a cam, guide, support or track roller bearing application. No need to "build up" a special unit when you can select the proper size standard CAMROL bearing engineered especially for the job. McGill's CAMROL bearing construction offers full type capacity, with provision for shock, in a compact precision unit. Specify CAMROL, the original cam follower, in either CF (with stud) or CYR (shaft mounting) series. Sealed and prelubricated bearing available also.



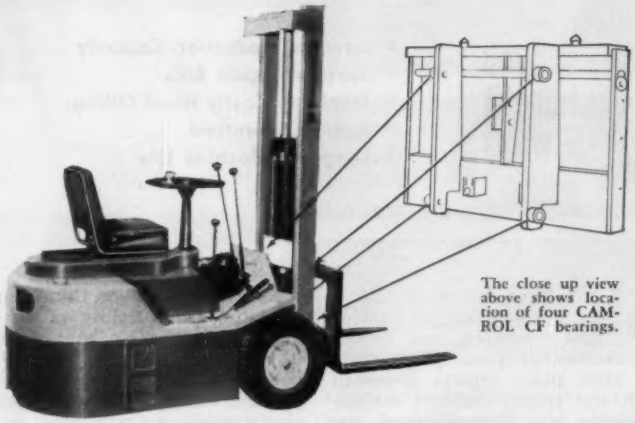
Solid construction can be lubricated through the side and the ends of the CAMROL CF stud.

CAMROL YR bearings help F-100 Super Sabre make slower and safer landing

The supersonic speeds obtained by today's modern aircraft set up design problems not encountered with older, slower planes. The overall streamlined design required for speed in flight, for instance, necessitated finding ways of supporting the North American F-100 Super Sabre at low air speeds required for landing. A

series of slats on the leading edge of the wing, providing greater lift at lower air speed, was the answer. Each slat is supported by McGill CAMROL YR bearings — especially designed to permit shaft or yoke mounting. These long-life bearings carry the loads of these slats as they move on tracks during flight of the Supersonic F-100.

CAMROL CF bearings out-perform friction rollers as fork support bearings



The close up view above shows location of four CAMROL CF bearings.

Small size and high load-carrying unit construction with simplified lubrication are among principal benefits obtained by Hyster Company from use of CAMROL CF bearings as fork support rollers in its Hyster 20 and other lift trucks.

Two bearings ride up and down inside each vertical mast section to position the lift truck fork under load. Speeds are relatively slow but the crushing loads on each bearing are heavy.

In this particular application, the exterior surfaces of the bearings are treated with a black oxide finish. This provides corrosion-resistance which serves to augment maintenance-free operation, a characteristic of CAMROL bearing construction.

Fact-packed Bearing Catalog

Write for your copy of Catalog 52-A, a revised, 128-page Bearing Selection Guide.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL
Precision Needle Bearings

McGILL MANUFACTURING COMPANY, INC., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA

Built into your equipment

BIJUR

AUTOMATIC LUBRICATION ASSURES SATISFACTION

you benefit 5 ways

- Increase Production Capacity
- Save on Repair Bills
- Eliminate Costly Hand Oiling
- Reduce Downtime
- Lengthen Machine Life

WITH Bijur Automatic Lubrication as an integral part of your machines, you benefit from continuous peak production. Plant after plant reports increased out-put and greatly reduced maintenance costs with Bijur-equipped machines. Costly downtime for lubricating by hand is eliminated. Every bearing is metered the proper quantity of oil at predetermined intervals. Work spoilage and bearing troubles caused by over-lubrication are avoided. Fire hazards are reduced. Personnel accidents are prevented.

More than a million Bijur-protected machines are currently in use. Hundreds of leading manufacturers standardize on Bijur as "built-in" components of their machines. Bijur emphasizes custom engineering, and will gladly cooperate with your machine builder in designing a lubricating system to meet the specific requirements of the machines you order.

Bijur designed into your machines now automatically assures satisfaction. It makes sense . . . and dollars, too! Why not write today for literature and engineering information?

P-2

1843

BIJUR
LUBRICATING CORPORATION
Rochelle Park, New Jersey
Pioneers in Automatic Lubrication

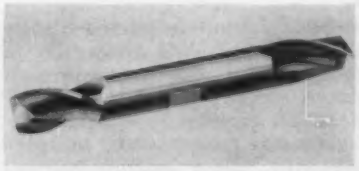
interlock prevents brake from slipping; automatic notch-per-cycle letdown assures positive control; safety handle prevents serious overloading.
Wright Hoist Div, American Chain & Cable Co, Inc, York, Penna

Nonionic surface active agents trademarked Poly-Tergent, for use as emulsifiers, wetting agents and dispersants, are alkyl phenol polyglycol ethers made from petroleum-base materials. They are available in tank car lots, and in 5- and 55-gal drums.
Olin Mathieson Chemicals Corp, Industrial Chemicals Div, Baltimore, Md

Part positioner, developed for holding parts that are to be joined to others by soldering, brazing, or welding, is provided with a multiple, freely swiveling ball-and-socket series that affords unlimited freedom of angular adjustment of part. Two models are available: 9-in.-high model has 1-in. clamping capacity, is priced at $14; larger model has 2-in. clamping capacity, can be used on work up to 4 ft high, and retails at $29.
R E Gunther, Princeton Junction, NJ

Wing-type wheel brake is now available on 4- and 5-in. Bassick casters of Diamond Arrow line. Brake enables caster wheel to be locked with touch of toe.
Bassick Co, Bridgeport 2, Conn

Self-locking anchor nuts of Kaylock line are available with thread relief in a complete range of sizes from 8-32 through ⅜-24. New design reduces need for shims and changes in bolt-grip lengths. Nuts are approved for use at temperatures up to 550 F.
Kaynar Co, Box 2001, Terminal Annex, Los Angeles 54, Calif



New End Mill Line

Fastcut N-Mills, made of HSS, up to ½-in. dia, are now available in 26 types, including single and double end, in 2, 3, and 4 flute, and a 2-flute slotting or router bit.
Fastcut Tool Co, 7405 E Davison, Detroit, Mich

ALLENPOINT will give you a bulldog grip at no premium in price!

Allen's scientific redesign of the cup diameter on set screws gives greatly increased resistance to *withdrawal* torque. You can count on Allenpoint Set Screws to stay tighter longer, under heavy strain and vibrations. This dependable premium performance of Allenpoints is yours to use without increasing the cost of manufacturing your products.

Uniform Class 3A Threads

Allenpoints' smooth, uniform threads prevent off-lead conditions like Fig. 1. With Allenpoints, you have full, even contact between the engaging flanks of the threaded members (Fig. 2) —and a tight friction lock over the entire length of the Allenpoint Set Screw.

Fig. 1

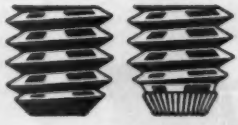
Fig. 2

Strong, clean, deep sockets allow full wrenching leverage

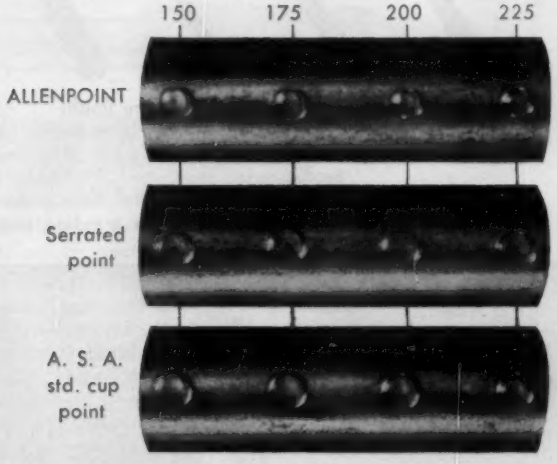
Sockets of Allenpoint Set Screws are cold forged to produce a deeper, smoother socket. No broach chips to interfere with proper seating of the key. This "pressur-forming" preserves the long steel fibers throughout the length of the screw—stronger walls allow maximum tightening torque.

One more full thread on ALLENPOINTS!

Allenpoint Set Screws have one more full thread than serrated point set screws. That means more holding power—especially important when you're using short lengths.



ALLENPOINT's performance compared for you



These actual-size, unretouched photographs show the cup pattern made by Allenpoints, serrated points, and A.S.A. standard cup point set screws in a 3/4" steel shaft. At each degree of tightening force, Allenpoints make a full circle pattern, penetrating deeper for greater holding power.

We'll be glad to send you more information and samples of Allenpoint Set Screws and other Allen Socket Screw products.

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ALLEN HEX-SOCKET SCREWS HEAD

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but plenty tough!

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The difference is in the finish!
All Wendt-Sonis drills, reamers, counterbores and other round tools are 30% smoother by profilometer readings. Flo-Finish, an extra operation applied after final grinding, practically eliminates grinding marks.

30% smoother Flo-Finish reduces chip friction — permits faster chip flow away from cutting edges — faster feeds and speeds. Lower chip friction also means less tool-damaging heat with a resulting increase in tool life. In addition, less power is required, and work finish is improved — in some cases by an average of 50%.

Micro-photograph (right side) shows how Flo-Finish eliminates grinding marks.

For detailed information on Wendt-Sonis tools, for competent technical assistance on tooling problems, see your Wendt-Sonis distributor's salesman.

Send for free 94-page Catalog No. 55—Address Dept. AM-457

WENDT-SONIS COMPANY

Hannibal, Missouri • Rogers, Arkansas

Round Table.

RETIREMENT TRADE

Would a retirement pool, in which a number of companies participated be practical? Then a worker who changed jobs, or was fired, could still be eligible for his retirement rights.

PENSION is a magic word. It may unlock the future for many and for many others it may be only a dream. Today the thinking is in terms of building a pension system within a company which has more appeal to the worker than what some other company offers. Or it is built upon the demands of organized labor and has been super-imposed upon the wage structure of the company. Truly these systems are not what we would like to consider pension plans They do provide for the individual at 65 if he stays with the company for that entire length of service. Yet if for any reason, the employee decides to move from the company that employee has lost all rights in any pension. Some plans, if the employee contributes to the system, allow the worker to get back what he has put into the plan plus a small amount of accumulated interest. Nobody doubts that this is fair treatment because the pension plan is used as an inducement to stay employed by one company. The idea has its merits and also many drawbacks, both from the company standpoint and from that of the worker.

Too often a skilled worker could be of more value to our economy if

"What's old dribble head cooking up now. . .?"

he went to work at some other company where his skill would be used to full advantage but he will not change jobs because he would lose his pension rights. Thus he is lost to the over-all betterment of our economic structure and general social welfare. He remains with the company doing his particular job satisfactorily but he is not completely utilized. The company in this case fails to realize the potential and is happy to pay the employee only for what he is now doing and revels in the glory of its pension plan which serves to hold employees so well.

The same factor can work against a company. Many times workers who do not commit acts that justify dismissal from a company standpoint, but who are not generally satisfactory employees, stay on with the company solely because of pension rights. Frequently the company would like to dismiss them, but is tied in many cases by organized labor and since the pension plan is so attractive everyone stays on even though they are not happy. Can there by any means be any gain for a company in this case?

While we use pension plans for bargaining little will ever be done to make it possible for an individual to really become secure from old age except to stay with one company through thick and thin over the years. The idea advanced by Ed is sound but it is several years away. Probably we will never see the day when pension plans are generally accepted and can be taken from one job to another with a minimum of loss to the individual. It would require cooperation between all industries, insurances, and banks — something which under today's competition and sharp variances could not be accomplished without a general order.

We do not want government interference in these pension plans. We do not want it to be high pressure, yet we do want to see it placed on a high plane where workers understand the plan. We want to see workers voluntarily go into the plan over and above the required amount. In other words, a plan with a fixed minimum withheld from the worker matched with company funds, plus a chance for the individual to invest any additional amount he desires each week or month. Let's make it a pension plan. Make it one that the worker feels he will really gain from. Then establish regulations for workers who change jobs so that benefits are not completely lost. A small fee for

(Continued on page 218)

reduce
vibration
INCREASE TOOL LIFE

WITH WENDT-SONIS
***NO-CHAT SHANKS**

FOR BORING BARS

GRINDING QUILLS

CUT-OFF TOOL

When tool vibration is reduced, finish is improved, deeper cuts can be made, and taper is eliminated in deep hole boring.

When tool life is increased, costs go down, profits go up.

So you save in many ways with "No-Chat" tool shanks specially engineered to reduce vibration, increase tool life. This very dense, rigid material is available rough or finished in round, square or rectangular stock. The W.S. line of standard "No-Chat" tools includes boring bars and cut-off tools.

For detailed specifications — for technical assistance in using "No-Chat" — see your Wendt-Sonis distributor's salesman.

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*"No-Chat" is a registered trade name of the P. R. Mallory Co.

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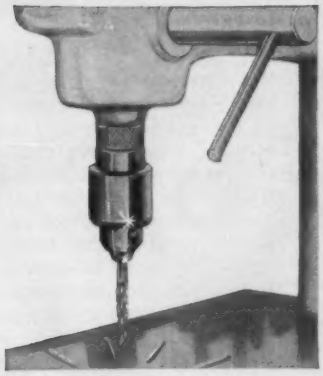

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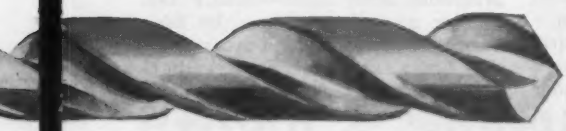

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the right to change jobs charged, perhaps, but not a penalty of complete loss of benefits as now occurs in the job changes.

If our organized labor and our social workers are really interested in the well-being of the average man, let them go to work on these ideas and build for a better America in the future years.

Charles D Townsend
West Hartford, Conn

COULD RETIREMENT pools be set up to keep a worker from losing out when he changes jobs, or gets fired? That question could very well be answered by asking another question: who would foot the bill for this happy scheme? Obviously, not the job-changing worker. Even if industry would agree to such a scheme, how could the insurmountable obstacle of multiplicity of pension systems peculiar to individual companies be brought into a common plan where a retirement pool could be practically worked out?

The "Retirement Trade" idea may sound good as a conversation piece but as a practical plan for actual use it would take more than the most skilled actuary to reconcile the pension plans that provide for disability retirement in some cases, insured pension plans or trusteed pension arrangements that other companies have set up, contributory pension plans, and non-contributory plans.

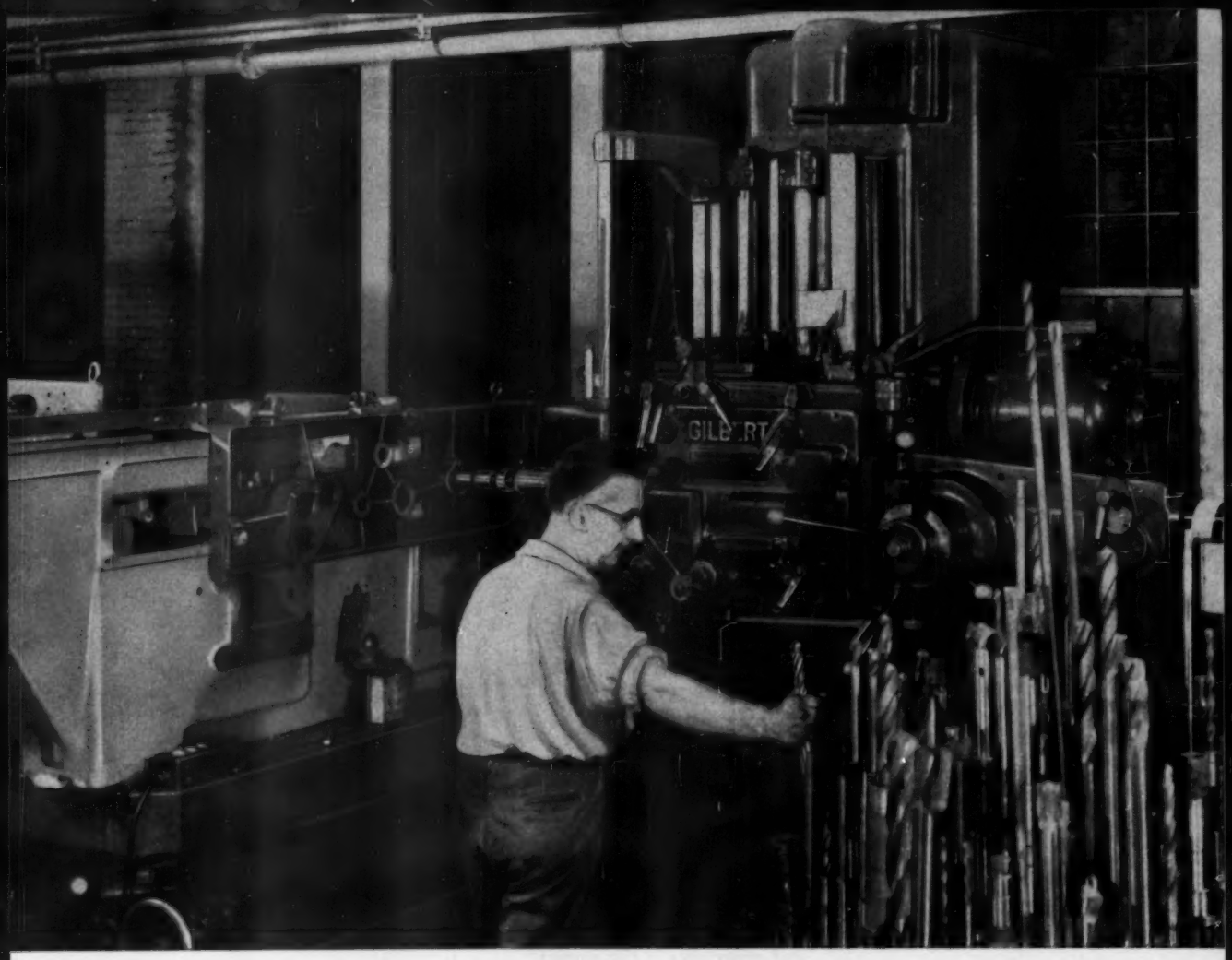
Furthermore, how could retirement pools be worked out where companies have schemes under which annuities become payable at normal retirement, and some at early retirement of the individual at the discretion of the employer or at the option of the employee after a certain length of service? Pension plans not only vary according to type of annuity provisions, but to suit particular financial setups of different employers and insurance companies handling the administration of the retirement plans.

Actuarial and mortality tables, and related factors used in the computation of pension contribution rates may be fairly common enough to permit setting up an initial pooling arrangement. But it would take an army of actuaries to set up one common group annuity schedule that could be used for working out a system where a man could transfer his retirement-pay rights when he transfers from one job to another. For example, many pension plans include the provision that makes employees eligible for disability retirement after a specified period of service, most commonly after 15 years, but there is a wide range in such eligibility provisions. How could this variable be reconciled in the universality of a retirement pool arrangement?

Statistics indicate that there are over 20,000 private pension plans covering more than 10 million employees, and requiring contributions in excess of $3 billion per annum. These plans embrace benefit arrangements fully funded on an actuarially sound basis. The widespread adoption of adequate private pension plans covering retirement of workers must be based on sound pension funding. Such funding could not be possible under a scheme such as envisaged in "retirement trade." The development of sound pension protection for workers would be adversely affected due to the unjustified increased cost of the retirement pool for job-transferring workers.

The retirement pool, for workers who change or lose jobs, would set up an arrangement by which each company belonging to the pool contributes money so that when a worker transfers from one company to another belonging to the pool, he would not lose his retirement rights. The strongest argument against this system is that most companies work their retirement plans through insurance companies and investment arrangements. Of the 20,000 pension programs, some 13,000—mostly the smaller plans—are insured by life-insurance companies and invest pension funds extensively in securities. The remaining 7,000 programs are

"Couldn't you give me plain old money instead of an Oscar for the best production?"



courtesy Brown & Sharpe Mfg. Co.

Brown & Sharpe cuts time 75% with Gilbert boring mill

"The handling time on this job has been reduced by 75% and the machining time has been reduced by 40%," says T. R. Buckles, Equipment Engineer for Brown & Sharpe Mfg. Co.

These profitable savings were earned by fitting a Cincinnati Gilbert boring mill with a Gilbert revolving table, adjustable on runway, and traveling tool holder designed by Brown & Sharpe.

There are about 180 holes in the workpiece. The boring mill performs drilling, reaming, tapping, or boring operations as well as some milling cuts. The job was formerly done on a radial drill, portable drill, and floor type miller.

This is another typical example of the time saved (and profits earned) by Cincinnati Gilbert horizontal boring mills. Our man will be glad to show you more examples.

The Cincinnati Gilbert Machine Tool Co.
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Low-cost financing plan—3% simple interest (4¼% add on), up to 5 years to p ay—makes your purchase of Gilbert equipment immediately feasible.

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handled privately either by company officials or bank trustees. It can readily be seen that the idea of a retirement pool that would seek to unify these heterogeneous arrangements would be impracticable.

As an alternative to the impracticability of the retirement pool, I would suggest the adoption of an employee-thrift plan that permits some investment in company stock. The thrift plan includes regular deposits by the employee and substantial employer contributions for purchase of company stock. It encourages employee thrift. The worker may pick his own range of contribution. The employer contributes a specified amount for each dollar an employee pays, or a stipulated portion of company profits. It is customary to allocate company payments in relation to employee contributions, thus creating an incentive for maximum participation. The thrift plan will give both the retiring employee and the one who leaves his job through transfer or dismissal a desirable reserve that will supply cash or income as needed to meet an emergency or supplement a basic pension payment.

The reality of accumulated savings resulting from an employee thrift plan offers a better financial cushion for the retired or temporarily displaced worker than the questionable retirement pool.

Harry Kaufman
Philadelphia, Penna

In continuation of discussion on "Retirement Trade" I would like to add that the main idea of the transferable retirement fund should be primarily a mutual protection of older help seeking employment, as well as managements involved in hiring of such semi-oldtimers, and, secondarily, an accumulation of funds for younger people.

In general it may not be entirely possible or practical to transfer in full the individual retirement fund, namely, the part contributed by an employee and the part contributed by an employer, which is usually classified as to be earned at retirement. However, it might be beneficial to establish a standardized transferability method for both parts in five or ten-year portions, giving the worker a chance to replenish not fully transferable employer's portion. In other words, carry over the retirement policy or agreement in full at a reduced group rate instead of at prohibitively high individual rates. This extra expense will take care of so-called perpetual job switchers. In permanent industries (job shops excluded) the periods of less than five years may not be credited, or solely credited at full expense of the worker.

With the pending problems of constantly growing percentage of older population, as well as the eagerness of the bureaucrats and industrial mediators to add more restrictions and taxes and obligations in the sector of the old-age pensions, it might be quite logical and useful to establish a modus vivendi in this matter.

I believe that this should be done without additional interference of associations or legislators. As long as the managing and the working bodies are selfish and slow, the unnecessary third party may enter the picture, causing friction or additional expense, or both.

W S Jaro
Dearborn, Mich

QUICK STUDY . . . OR TRY-AND-SUCCEED?

Is a foreman the best judge in sizing up and placing a job applicant in his own department? Or is Personnel better equipped to gage the abilities and experience of the worker?

I DON'T blame Ed one bit for getting the razzle-dazzles over the new Personnel plan on hiring men. There are a lot of necessary details that they can relieve me of such as name and address, age, grandmother's pet

(Continued on page 224)

(Advertisement)

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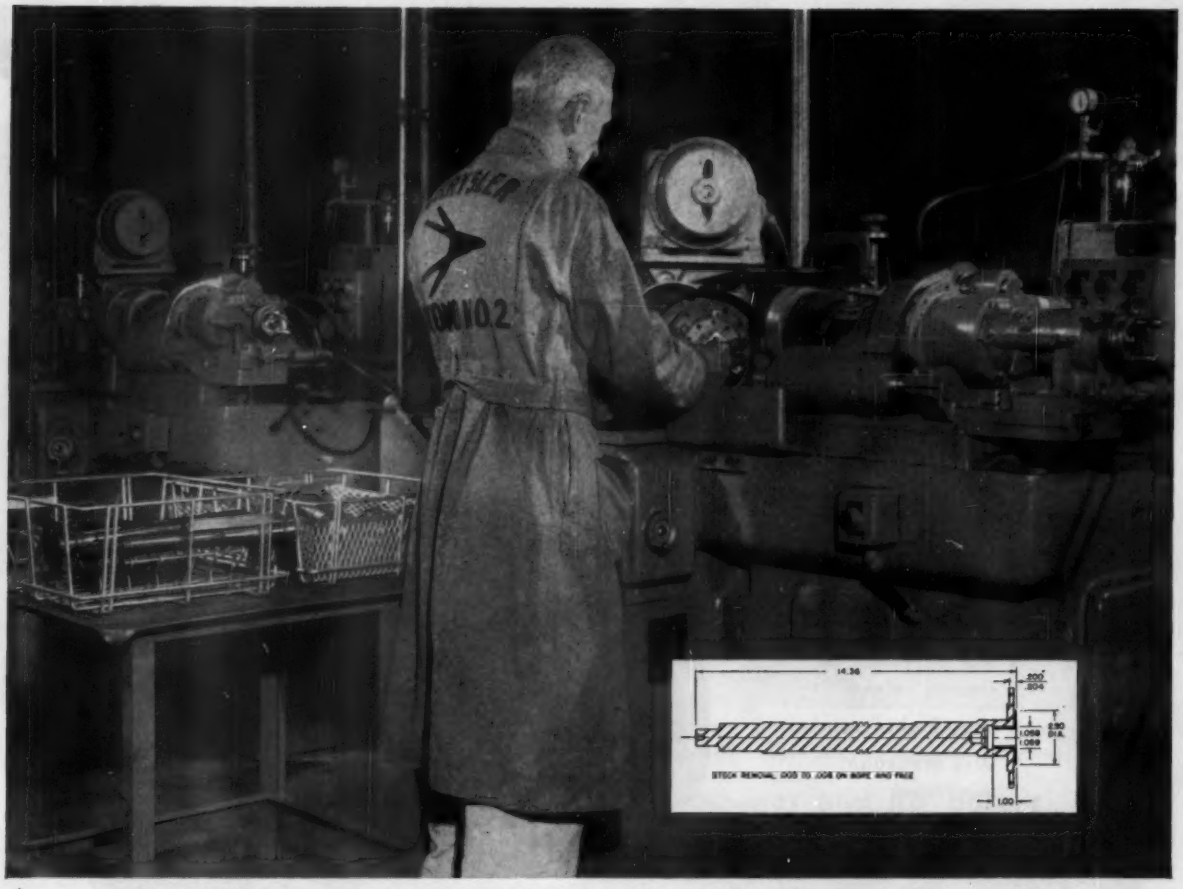
The 1957 Chrysler Imperial



A Bryant 2209-Y grinds transmission output shafts at Chrysler's new Kokomo, Indiana Torque Flite Automatic Transmission Plant.

Chrysler "guns" its production with BRYANT INTERNAL GRINDERS

The automatic transmissions in 1957 Chryslers – and in all other Chrysler-built cars – are designed for long-lasting, trouble-free operation. Making them so, and doing it profitably, calls for mass-producing the precision machined parts, such as transmission output shafts.

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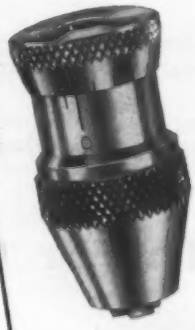
The Albrecht Heavy Duty Drill Chuck is available in 11 taper back models in capacities up to ⅝". This is a keyless, self-tightening chuck of exacting accuracy.

The Albrecht Small Drill Chuck Model No. 15 JO



Model 15 JO is especially designed for small diameter drills. It has a maximum capacity of 1/16" and a minimum well under the No. 80 drill. Like the heavy duty models, No. 15 JO is keyless, and self tightening.

The superlative performance of this precision chuck is now available to you through your Jacobs industrial supply distributor. He is backed up by replacement parts stocked in the United States, plus the finest service facilities anywhere.

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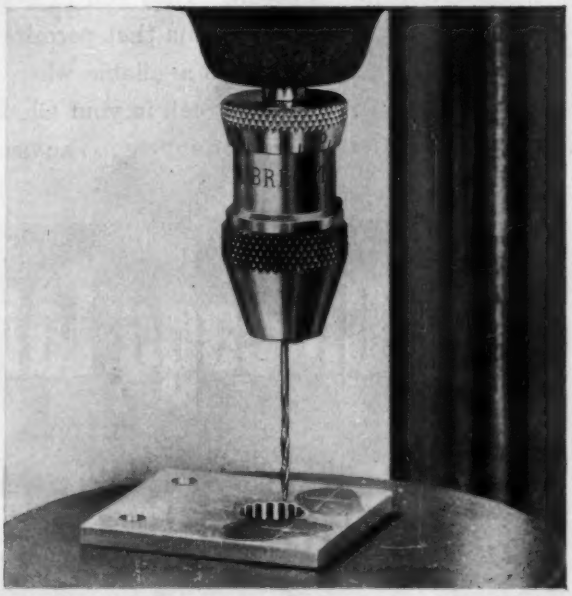
Close tolerance drilling easily accomplished on a tool room milling machine.

Get the finest performance from your jig borer with the world's most accurate keyless drill chuck.

Albrecht Chucks are ideal on milling machines and jig borers

The Albrecht Keyless Chuck is ideal for use on high speed sensitive drilling machines.



The Albrecht Small Chuck, Model 15 JO, is the finest keyless chuck available for accurate drilling of the smallest holes.

Close tolerance drilling on high speed drill presses

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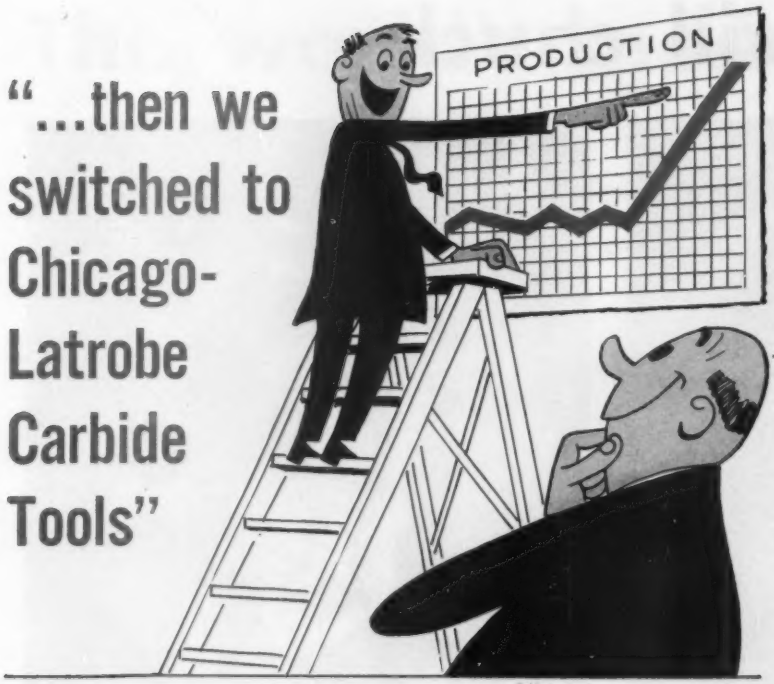

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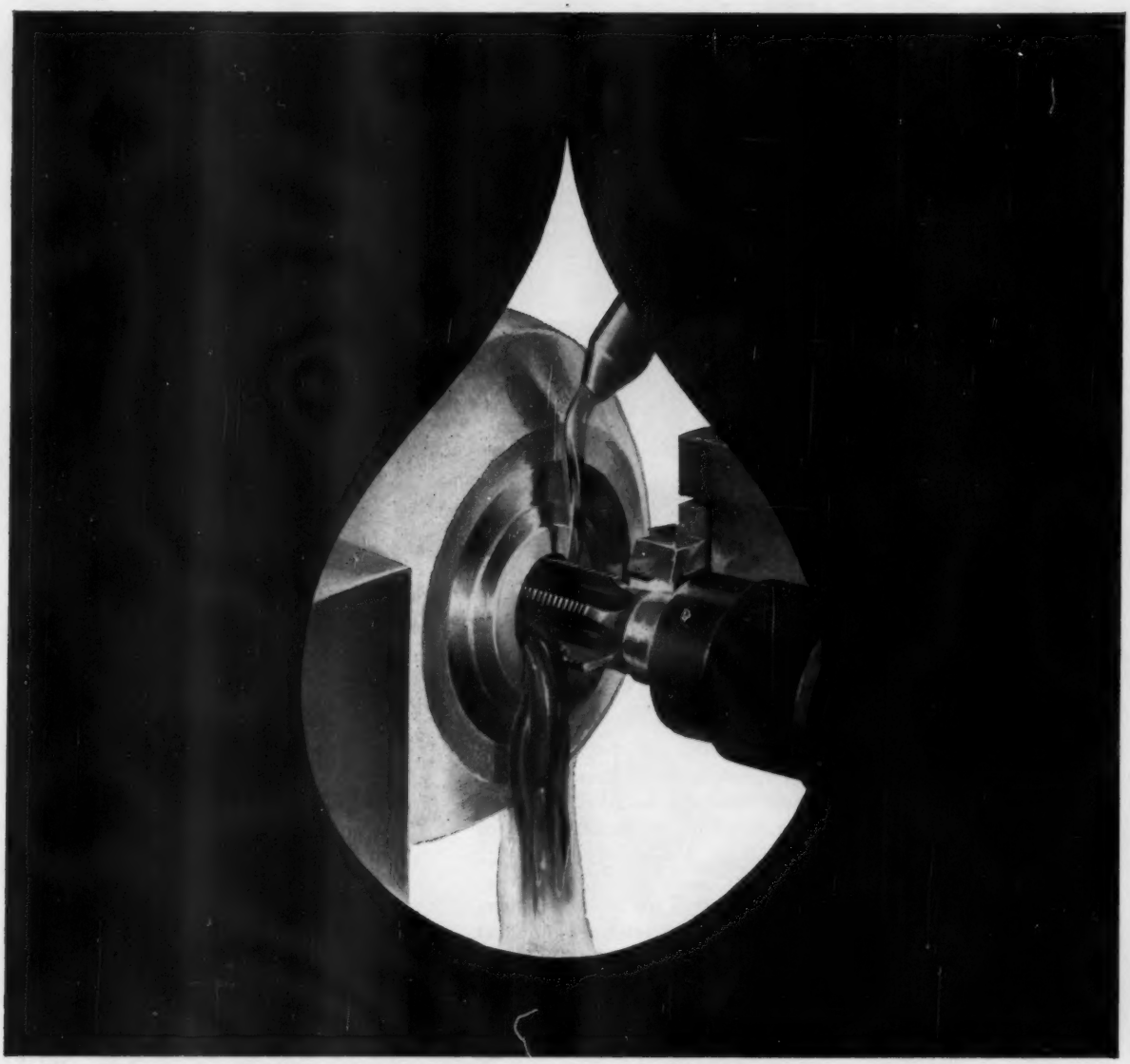
hobby, and so forth, but I'm not blind enough yet that I don't want to see what I'm getting.

As a supervisor of a department I want to know what kind of men are coming in there; I don't want anybody else to do my picking. If such a thing as having someone else say who is or who is not going to work for me is thrust upon me I'll just have to swallow it and do the best I can. I'll assure you that I'm going to get some peculiar individuals compared with what I would get by my own selection. Sure, it takes a little time to have a talk with an unknown, but in doing so I can uncover a multitude of sins that are certainly costly to a department.

Imagine Ed getting a call from the big shot down in the front office: "I've got a whiz for your department, Ed. From the sound of him he's going to do wonders for your production. I'm going to put him through the preparatory course for a couple of days then have him brought in to have you look him over."

I don't object to having a new man go through a training course which will acquaint him with the details of procedure and with the plant's policies relative to the relationship between the employees and the employer, after I have boiled him in my own oil to find out what kind of a guy he is and, through a certain interrogatory technique, determine what he knows about the job he applied for. I want to know if he's got what it takes to be a member of my gang. I don't want him to toot his own horn to someone else, for I know the kind of music some birds can put out. To have some knothead have all the say as to his fitness to another knothead

"I had a hell of a D-A-Y."



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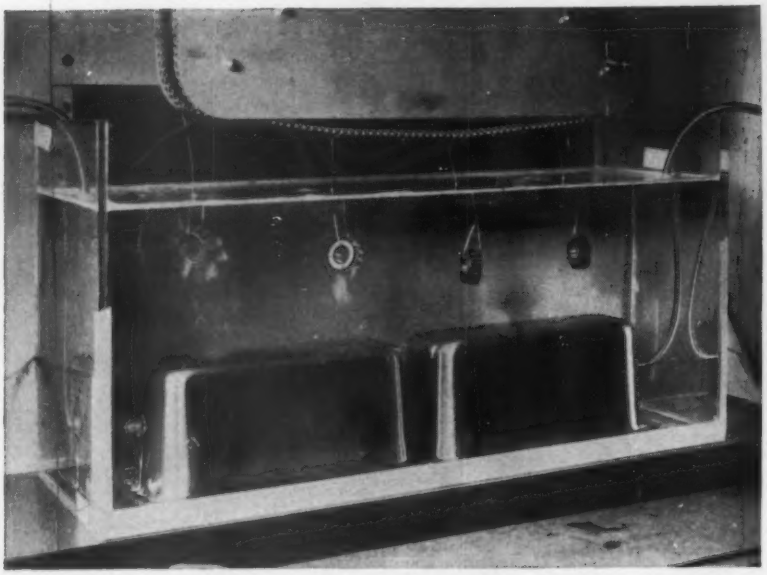

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Lowest cost conveyorized automatic ultrasonic cleaning is now practical with these new General Ultrasonics D-52 immersion Sonicells. Each unit provides a full 52 square inches of radiating area, operating at 20,000 cycles for maximum effectiveness.

The improved, customer-tested, D-52 has all-welded stainless steel construction and an exclusive internal design that results in great ruggedness, high efficiency and long life. Groups of D-52's provide efficient and economical operation in tanks and vats of unlimited volume in all the usual cleaning solutions.

These Sonicells are powered in large installations by exclusive GU motor generators for maximum dependability. Smaller installations are powered by our Model 700 and Model 400 electronic generators designed for continuous operations. All controls are simple and easy to operate.

The increased power of these new units has proved highly successful for the most difficult and largest cleaning operations to remove dirt, buffing, grinding and lapping compounds and also to replace hand cleaning operations on blind surfaces.

For further information or demonstration call or write.

GU THE GENERAL ULTRASONICS COMPANY
67 Mulberry Street • Hartford 3, Conn.

THE ULTIMATE IN ULTRASONICS

who is capable of swallowing anything that is dished out is a little more than I can tolerate.

I concur with the idea of having a new man go through a training course but don't try to shove one of these three-cylinder gaboes on me and expect me to do my share of making the company profits.

I'll have to admit that occasionally an applicant is so good in presenting himself that I fall for his line with the hook and sinker attached but, on the whole, I can spot a phony at the drop of a hat. It is better that I waste a few of my precious minutes before the office gets hold of a man because the final result is a saving of many valuable hours. After I get through with my preliminary chat, and it looks like my time hasn't been wasted, I have the chap look over several jobs in process and it's surprising how deep beneath the skin you can get and how much you can find out.

Jack Everett
San Francisco, Calif

VACATION RIGHTS

Should employees be required to work a full year before they're eligible for a vacation? Would it be practical to allow them to take it in separate days as they become eligible month by month?

Happy employees are productive employees. Modern life is blessed with many conveniences but it is still beset with many pressing, nerve-racking problems. We live under pressure and it seems to be increasing at every turn. Every advancement, every step forward, brings with it added responsibilities. Everyone is troubled by the con-

"I see you hired another tall secretary."

stantly rising cost of living, the threat of inflation, and numerous personal problems. Even the simple operation of traveling to work can develop into a daily chore of crowded trains and traffic jams.

A relaxing vacation is essential at least once a year. Fifty weeks is a long time to wait for a vacation, and to be forced to miss it is tantamount to frustration. A man does not change jobs except for a good reason. If laid off or forced to change jobs in the spring, the man has enough trouble without missing his vacation as well.

A few days off for a man who started in the spring represents a small percentage of the year's work. The average plant works about 245 days a year, so 2½ days off represents only 1% of the year's work. This is indeed a small payment for increased efficiency which can last for months. An improved attitude toward the company can easily result in a 10% increase in the work the employee turns out.

The company should give the employee these few days off because of the advantages which will accrue to itself, not because of any nation-wide plan. It is not very practical to establish an over-all nation-wide plan to provide everyone with a two weeks' vacation regardless of when they change jobs. It is an idea with some merit but it would be difficult to operate. Some small companies might try to circumvent some of the vacation expense by reducing their working force over the summer months.

The company should make every effort to provide new employees with at least a few days' vacation during the summer months.

Clifford Molloy
Bronx, NY

Everyone wants less work, more pay, and longer vacations. Yet we cannot expect these things unless we recognize responsibilities and obligations. I do not believe in free handouts; things given away are not appreciated. It's the things we work for that are.

However I do think that one week's vacation should start after nine months' employment. Two weeks' vacation should start after eighteen months. Service usually means something in the average business. It should be recognized by some tangible reward.

A E Salmons
Norristown, Penna

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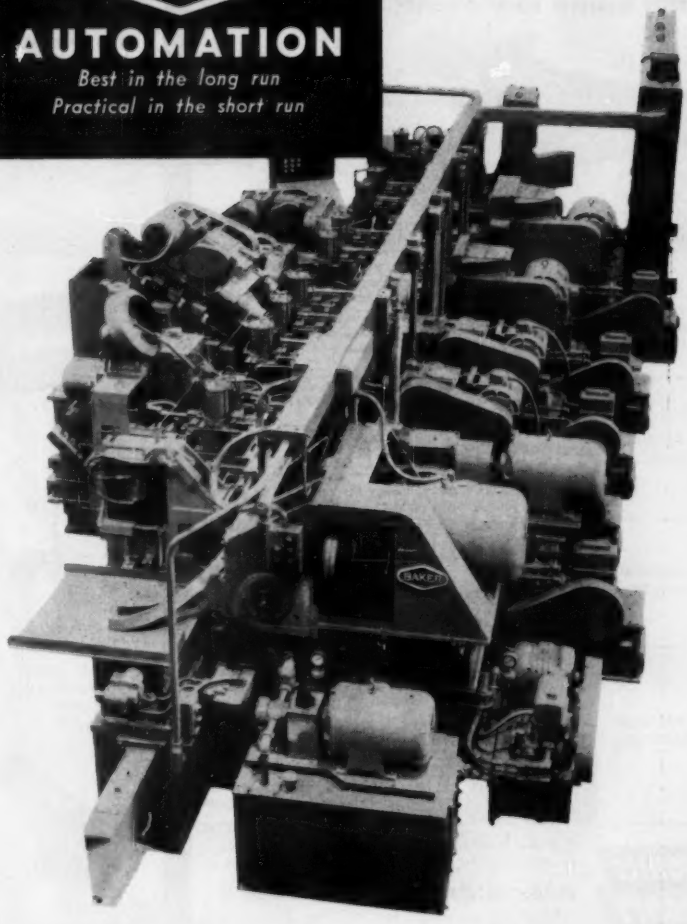
Best in the long run
Practical in the short run



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ups production to 75 main bearing cap assemblies per hour.

Operations are: drill, ream, mill, tap, assemble dowels, and separate — all automatic.

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Remember when Baker made nothing but gear-feed drilling machines? Quite a contrast with modern Baker specials — the bulk of Baker output today.

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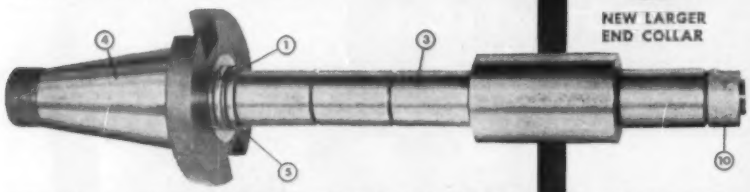

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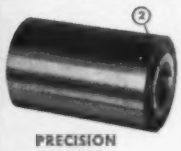
These benefits	...for these reasons	..result from these PREMIUM features
PREMIUM ACCURACY	No "cocking" of spacers when "snubbed up" on arbor.	1. New, larger end bearing and collar insure perfect alignment; 45 deg chamfer in collar for clearance over fillet.
		2. Bore and outside diameter of bearing sleeves concentric within .0005 in.; faces of sleeves and collars parallel within .0002 in.
PREMIUM TOOL LIFE	No runout, each tooth of cutter takes its share of the load.	3. Arbor and pilot diameter held to plus .0000, minus .0005 in. with .0005 in. minus tolerance.
		4. Taper held within .0002 in., with 10-20 micro-inch finish.
		5. New, larger size and grooved OD make it easy for operator to identify end collars, help to prevent mistakes.
PREMIUM PRODUCTION	Reduce down-time.	6. Keyways standard in all sleeves and collars. Can be keyed to arbor to prevent rotation.
		7. True-running arbor helps eliminate premature cutter failure.
	Reduce setup time.	8. Adjustable spacing collar speeds adjustment between gang mills and saws.
PREMIUM ARBOR LIFE	Accuracy lasts, longer.	9. Forged steel arbors hardened throughout to 42-45 Rockwell, "C". Sleeves hardened on OD and faces to 60 Rockwell, "C". Collars hardened throughout to 40-45 Rockwell, "C".
		10. Hardened and ground threads for arbor nut.
	Fortified against breakage under heavy loads.	11. New, larger fillet increases strength at stress point between arbor and shank.



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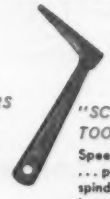
Take shock and abuse of heavy loads turning at high speeds.



"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes ... protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.

CENTER DRILL DRIVERS

Offset splined section gives positive drive in drill flutes and protects cutting edges.

DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

New Books...

MECHANICAL WORLD YEAR BOOK (1957 EDITION). *Published by Emmott & Co Ltd, 31 King St W, Manchester 3, England. 254 pages 4 x 6. Price 65¢.*

Following their traditional plan of keeping this publication completely up to date, the editors have carried out considerable revision of the section on steam turbo-generators, adding certain important technical matters relating to the latest developments, because of the increasing importance of these units. The section on presswork has also been completely revised, as has the section on boiler mountings. Minor revisions have been made in several other places in the text.

•

HYGIENIC GUIDES. *Published by American Industrial Hygiene Assn, 14125 Prevost, Detroit 27, Mich. Single sheet 7 x 10, punched for loose-leaf binding. Price 25¢.*

To add to the series of hygienic guides already published, the Association has now produced individual pages dealing with carbon disulfide, ethylene dichloride, hydrazine, methylene dichloride, and nickel carbonyl. Each guide is devoted to a single material and gives the latest available information on potential hazards, maximum allowable concentration to which employees may be safely exposed over long periods, and engineering and medical methods of control. Major uses in industry and references to technical literature on the subject are also given. Previously published are guides dealing with other materials ranging from acetaldehyde to zinc oxide.

•

JIG AND FIXTURE DESIGN—*By P S Houghton. Published by Chapman and Hall, 37 Essex St, London WC 2, England. 256 pages 5½ x 8½. Price 36/- ($5.00).*

Practical, well thought out, and carefully graded to suit the increasing knowledge of the student, this is an excellent work for training the young engineer in the fundamentals of tool design. A serious drawback for the American student, however,

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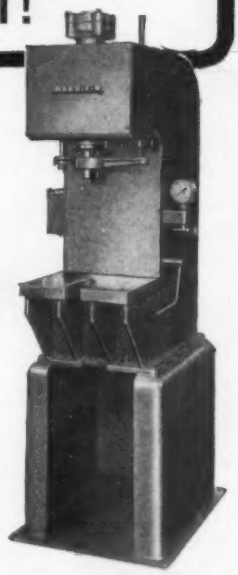

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A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

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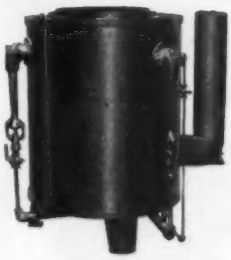

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lies in the fact that British terminology is used throughout, and that first-angle projections are used in all the drawings.

Subjects covered include a discussion on the need for jigs and fixtures, how production is planned, and materials used in fixture building. Two chapters deal with the fundamentals of fixture design, followed by information on clamping and indexing. Seven chapters are devoted to individual types of fixtures for the various machining operations. Closing chapters concern gears, power clamping, dimensional standards (British), and a discussion of motion study.

•

CHANGING PATTERNS AND CONCEPTS IN MANAGEMENT — *Published by American Management Assn, 1515 Broadway, New York 36, NY. 55 pages, 6 by 9 in. Paper cover. Price $1.75 (AMA members: $1).*

No. 182 in the AMA General Management Series, this booklet offers four articles on motivational forces influencing human behavior, and their importance to efficient business operations. A theory of management is presented that is based on the integration of motivation research with existing theories of scientific management.

•

MECHANICS FOR ENGINEERS: STATICS: —*By Ferdinand P Beer, professor of mechanics, Lehigh University, and E Russell Johnston, Jr, associate professor of civil engineering, Lehigh University. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, NY. 350 pages. Price $4.50.*

This textbook, designed for the first college course in mechanics, approaches mechanics as a deductive science in which practical problems can be solved by the logical application of a few fundamental principles. Practical examples are introduced throughout the book to illustrate these principles.

The text is divided into units under the following major headings: Statics of Particles, Statics of Rigid Bodies in Two Dimensions and in Three Dimensions, Centroids and

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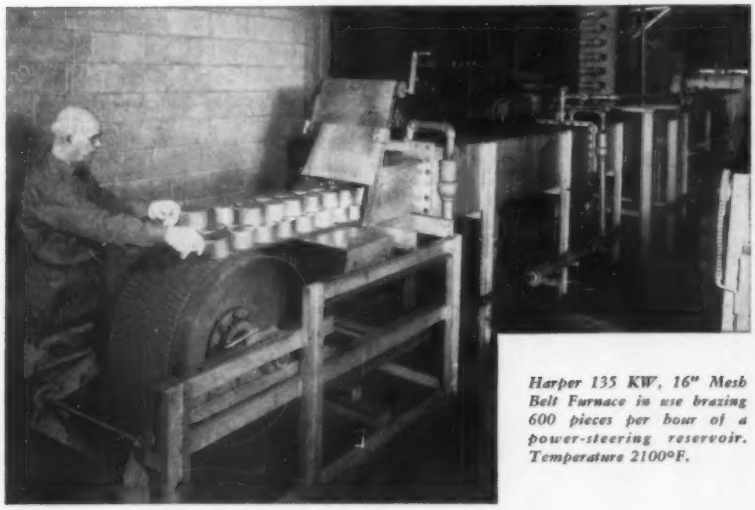

Harper 135 KW, 16" Mesh Belt Furnace in use brazing 600 pieces per hour of a power-steering reservoir. Temperature 2100°F.

If you need up to 50% greater continuous furnace capacity without increasing space; and if your operating temperature range is 1800°-2100°F, a modern Harper Mesh Belt Furnace may well be the answer to your requirements.

These compact continuous furnaces are designed to utilize fully the advantages of silicon carbide heating elements* and today's high temperature oxidation-resisting alloy mesh belts.

Silicon carbide resistance heating elements allow high concentration of heat in a small space, thereby providing considerably greater production than furnaces of similar size using ordinary nickel alloy elements. Silicon carbide elements are also replaceable without complete furnace shutdown.

Two more important advantages of Harper Mesh Belt Furnaces are:

1. MULTIPLE-ZONE HEAT CONTROL — Heating elements are connected in several individually-powered and controlled zones for maximum flexibility of the heating curve.
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There are many more plus values. These economical furnaces are designed for operation with all types of standard atmospheres. An automatic non-loading belt take-up mechanism adjusts belt tension without reducing useful belt loading. A small water-cooling chamber next to the hot zone can be readily removed for maintenance or replacement due to rapid oxidation.

Harper Mesh Belt Furnaces are available with or without alloy muffles. Matching preheat furnaces are also obtainable. For full information write for Bulletin 454 to Harper Electric Furnace Corporation, 33 River Street, Buffalo 2, New York.

*Nickel alloy elements available for lower temperature applications.

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For Continuous Brazing, Sintering, Wire Annealing, Bright Annealing, Annealing, Forging and Research

Centers of Gravity, Analysis of Structures, Forces in Beams and Cables, Friction, Moments of Inertia, and Methods of Virtual Work.

Each unit consists of one or several theory sections, one or several sample problems, and a large number of problems to be assigned. The sample problems amplify the text and, at the same time, demonstrate the proper methods for working out the assignment problems.

The text has had several years of classroom use in preliminary form before being published. The material is presented rapidly, but it is well-organized and carefully explained.

•

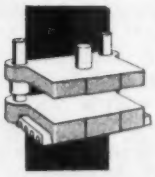
OPERATIONS RESEARCH: A BASIC APPROACH — *Edited by Elizabeth Marting. Published by American Management Assn, 1515 Broadway, New York 36, NY. 111 pages, 6 by 9 in. Paper cover. Price $3.75 (AMA members: $2.50).*

This AMA Special Report No. 13, which consists of eight articles by executives with experience in the subject, discusses operations research without excessive dependence on mathematical formulas. By showing the applications of operations-research techniques in a number of industries, the report gives the typical operating executive a good introduction to this technical subject.

•

PHYSICAL ABILITIES TO SUIT THE JOB —*By Bert Hanman. Published by American Mutual Liability Insurance Co, 142 Berkeley St, Boston 17, Mass. 145 pages. Price $2.50.*

This book represents a solid attempt to bring management, medicine, and engineering closer together in doing something about adopting better methods of dealing with the medical aspects of job placement and adjustment. It is not just another book on placement for the handicapped, but rather is geared to an interpretation of how best to analyze the physical composition of both workers and jobs in order to keep each employee within the range of his own abilities



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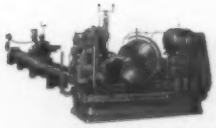

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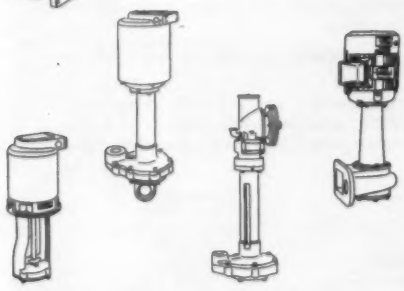

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and out of the danger of injuring himself or others.

Contained in it are time-tested plans that can be used by large or small companies, with or without a staff physician, personnel man, or job analyst. Highly informative and practical, the book is based on industrial personnel practices in the US, Canada, and twelve European countries and should be a real help in expanding the philosophy of industrial medicine and engineering.

•

STRENGTHENING SUPERVISORY AND EXECUTIVE PERFORMANCE — *Edited by M J Dooher. Published by American Management Assn, 1515 Broadway, New York 36, NY. 63 pages, 6 by 9 in. Paper cover. Price $1.75 (AMA members: $1).*

In this AMA report, Personnel Series No. 167, top executives report on their companies' actual experience in strengthening supervisory and executive performance for future operations. Papers include a report by Roy C Ingersoll, Chairman of the Board of Borg-Warner Corp, on the necessity for analyzing management's role in our economy with greater depth; a discussion by T W Prior, Director of Training of the Goodyear Tire & Rubber Co, on his company's program of executive apprenticeship; and a presentation by E H Reed, Manager of the Education and Personnel Dept of the International Harvester Co of that organization's practical plan for executive development.

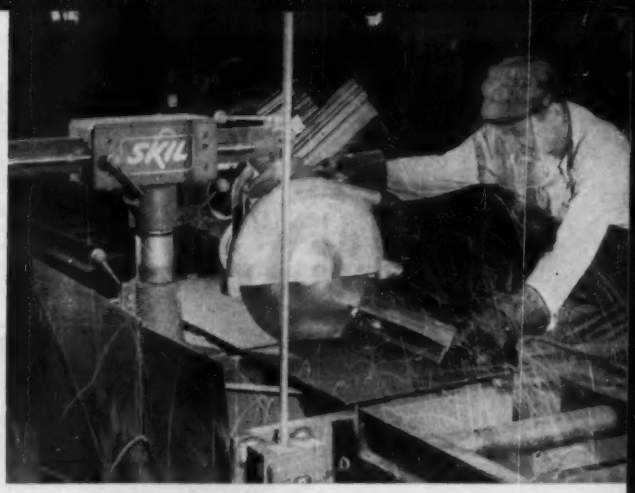
•

PATENT NOTES FOR ENGINEERS [*7th Edition*]—*By C D Tuska. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 192 pages, 6 by 9¼. Price $4.*

This manual, designed to bridge the gap between engineers and patent attorneys, provides a clear picture of what patentable inventions are and how to protect them. Chapters explain how applications are prepared, filed, and acted upon, and what happens when applications of rival inventors are placed in interference. Case histories and court decisions are frequently quoted for clarifying purposes.

Saves 30% time

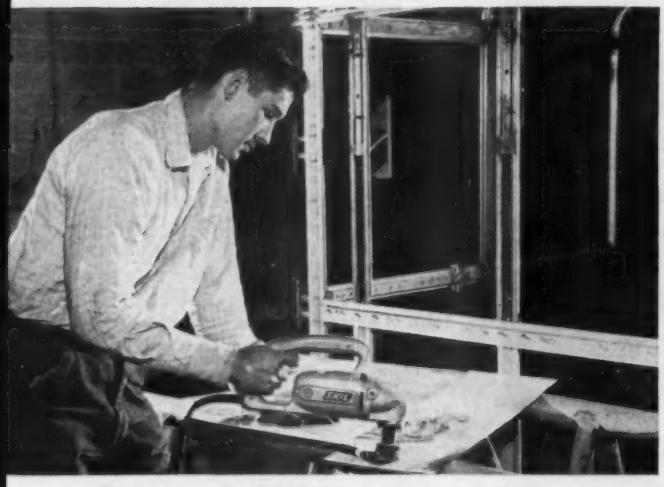
The Columbus Heating & Ventilating Co., Columbus, Ohio, owns an all-around inventory of SKIL tools. The reason: practically no maintenance, light-weight, better balance, adaptability. Mr. Clarence Fine, shop foreman, singled out the SKIL Model 825 Disc Sander as a tool that stands up under continuous operation. "In addition", says Mr. Fine, "it's 30% faster than anything else we've tried."



Saves 8 hours labor costs a week

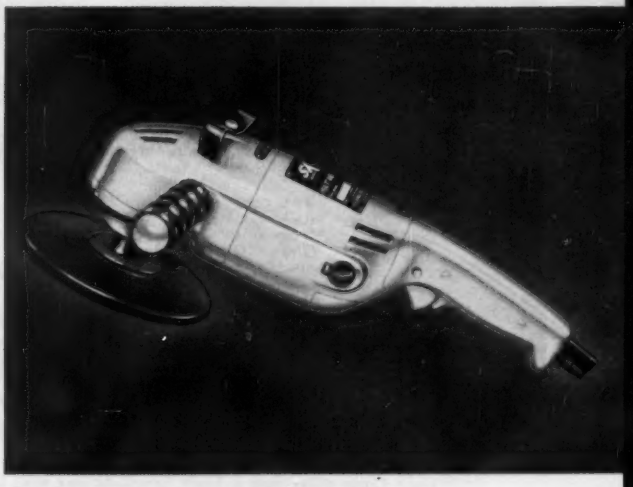
Five years ago, Trailmobile, Inc., Cincinnati, bought a SKIL Model 450 Radial Saw. Since that time four more such saws have been added with these results: "Each one saves us one 8 hour day labor costs per week", says Mr. Herman Suter, portable tool supervisor. "We have eliminated the sanding operation of rough edges caused by a cutting torch."

It's true! You SAVE with SKIL Tools



Saves $100.00 per week

"Our new SKIL Shear paid for itself in the first week", says J. M. McLain, owner of J. M. McLain & Sons Trailer Company, Houston. "In using other makes of shears we found that maintenance costs were about to run us out of business. Some operations were cut from 30 minutes to 1½ minutes. My men like SKIL shears because they are easier to handle, adaptable, and are cheaper to run."



YOU, TOO, CAN SAVE

NEW! SKIL 7" Model 852 Disc Sander. Save time and effort on the toughest sanding, wire brushing, grinding. New, powerful motor stands up under the heaviest work load. No matter what you have to sand, grind, saw or drill, there's a SKIL tool that can do the job better, faster, cheaper. Ask your SKIL distributor to show you why. Or use the coupon below for further information.

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PORTABLE TOOLS

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Made only by SKIL Corporation, Chicago 30, Illinois, Factory branches in all leading cities.

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A Complete Line Including

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FIBER CARTRIDGE FILTERS

- **FOR COOLANT LIQUID SYSTEMS** . . . remove chips and grinding swarf from stream . . . insuring far finer finishes on surface and centerless grinding and machining operations.
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- **FOR LUBE OILS** . . . insures protection against chips, swarf and other harmful particles accidentally introduced into system.
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Two cartridge types — White Cellulose and Wool — provide filtration from 5 to 75 microns. Exclusive Cuno "Graded Density" feature *doubles* cartridge life . . . cuts replacement costs *in half!* A complete line of standard Cuno Housings is available for every application requirement.

* Only Cuno offers you a truly complete line that includes *several* distinct types of filter media. Cuno also offers a complete application engineering service through the Cuno Field Engineer conveniently located in your area. He is qualified to help you select the right filter type and model to solve your problems.

WRITE NOW FOR FULLY DESCRIPTIVE PRODUCT LITERATURE . . . *Free Micro-Klean Bulletins will be sent to you by return mail.*

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TELEPHONE: BEverly 7-5541

EDGE-TYPE, WIRE-WOUND, SCREEN, FIBER CARTRIDGE and POROUS METAL FILTERS

Filtration Engineers in Principal Cities

Names in the News . . .

William H Stapleton has been named to the new post of general manager of purchases for Inland Steel Co. He has been serving as purchasing agent at the company's Indiana Harbor works.

John F Myers, vice president of Westinghouse Electric Corp, has been appointed general manager of the company's marketing subsidiary, the Westinghouse Electric Supply Co. He will take over the duties of **Victor D Kniss,** who has resigned as president of Wesco.

Wayne E Brooks, formerly associated with General Tire & Rubber Co, has been named sales manager of the Molded Fiber Glass Co, Ashtabula, Ohio.

H J Kinkade has been appointed manager of the Perfex-Pak Division of the Perfex Corp, Milwaukee manufacturer of heat transfer equipment.

Carl B Wooten has been appointed executive vice president of Trecker Aircraft Corp, a subsidiary of Kearney & Trecker Corp. He recently resigned as sales manager of the Aero Design & Engineering Co, Bethany, Okla.

George C Meibuhr, chief engineer of Automation Development Corp, Mentor, Ohio, has been elected vice president, engineering.

John G Frischkorn has been appointed assistant sales manager of the Cleveland Tramrail Division of Cleveland Crane & Engineering Co, Wickliffe, Ohio.

Clifford Tuttle, formerly associated with Bridgeport Brass Co, has joined Vitramon, Inc, Long Hill, Conn, as sales manager of Vitramon capacitors.

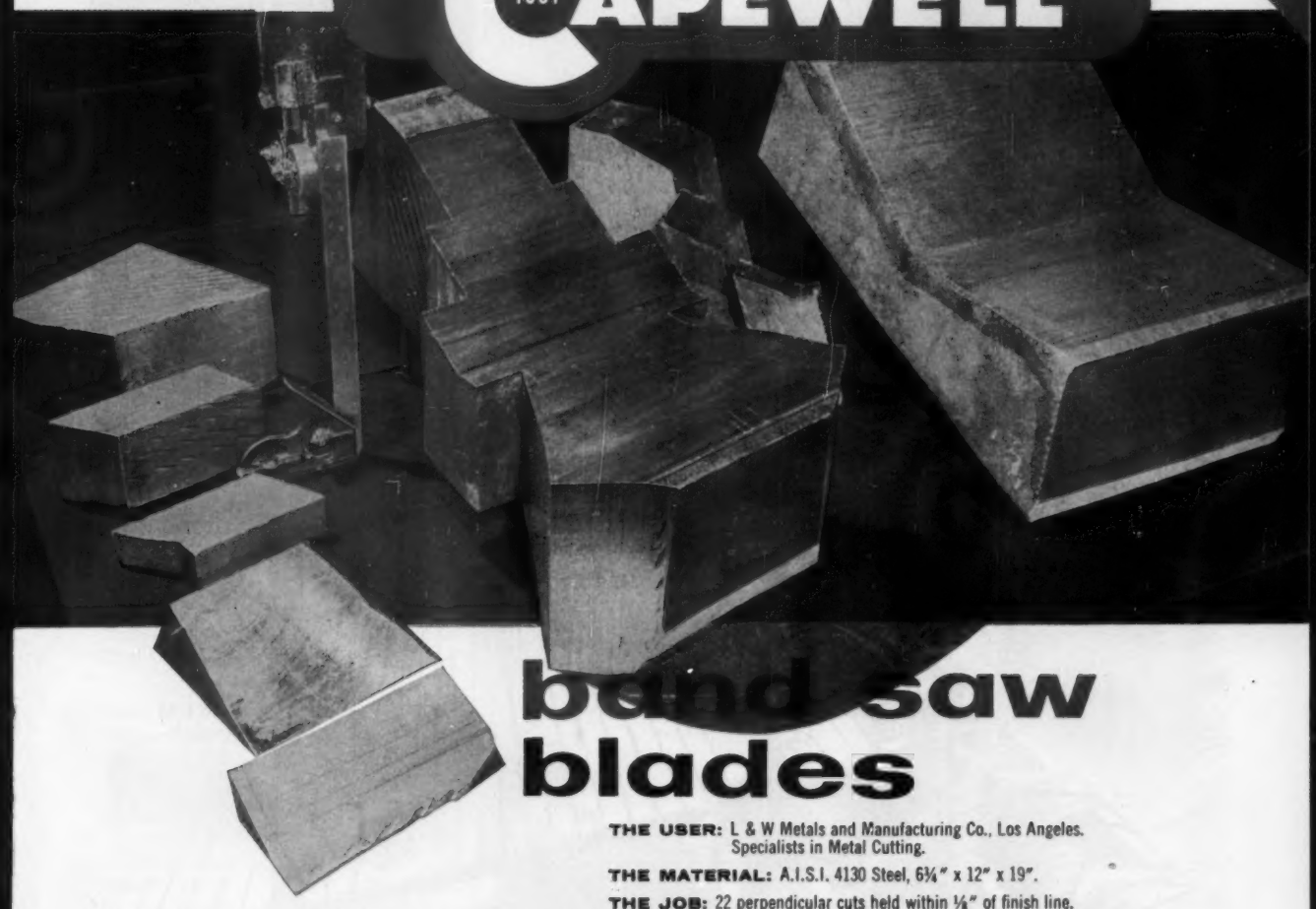
Harry M Cook has been named manager of industry sales of Clark Controller Co, Cleveland. Formerly district manager of the Buffalo-Syracuse sales area, he replaces **W R Heckman** who has been appointed assistant manager of operations for the company.

Don Goodwill, a member of Lees-Bradner Co's engineering depart-

Made only by SKIL Corporation, Chicago 39, Illinois. Factory branches in all leading cities.

cut it with stop

1881 CAPEWELL



band saw blades

THE USER: L & W Metals and Manufacturing Co., Los Angeles. Specialists in Metal Cutting.

THE MATERIAL: A.I.S.I. 4130 Steel, 6¼" x 12" x 19".

THE JOB: 22 perpendicular cuts held within ⅛" of finish line.

THE PROBLEM: Precision cutting with blade guides 14" apart.

THE ANSWER: 1" 3T. Radius Tooth Capewell Metal Cutting Band Saw Blade.

THE RESULT: Tolerance easily held to specification with complete customer satisfaction.

76 CAPEWELL ANNIVERSARY

Capewell Band Saw Blades can give you production bonuses, too. Available in regular, skip or shark tooth design, Capewell blades stay sharper longer and give more cuts per blade. Tooth by tooth, Capewell blades are a superior product, manufactured to rigidly controlled specifications—insist on Capewell for proved maximum saw performance and production economy.

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who provide: complete inventory

. . . engineering assistance

. . . delivery when you need it.

THE CAPEWELL MANUFACTURING COMPANY
Hartford 2, Connecticut

Please send complete details on Capewell Band Saw Blades to:

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A56A

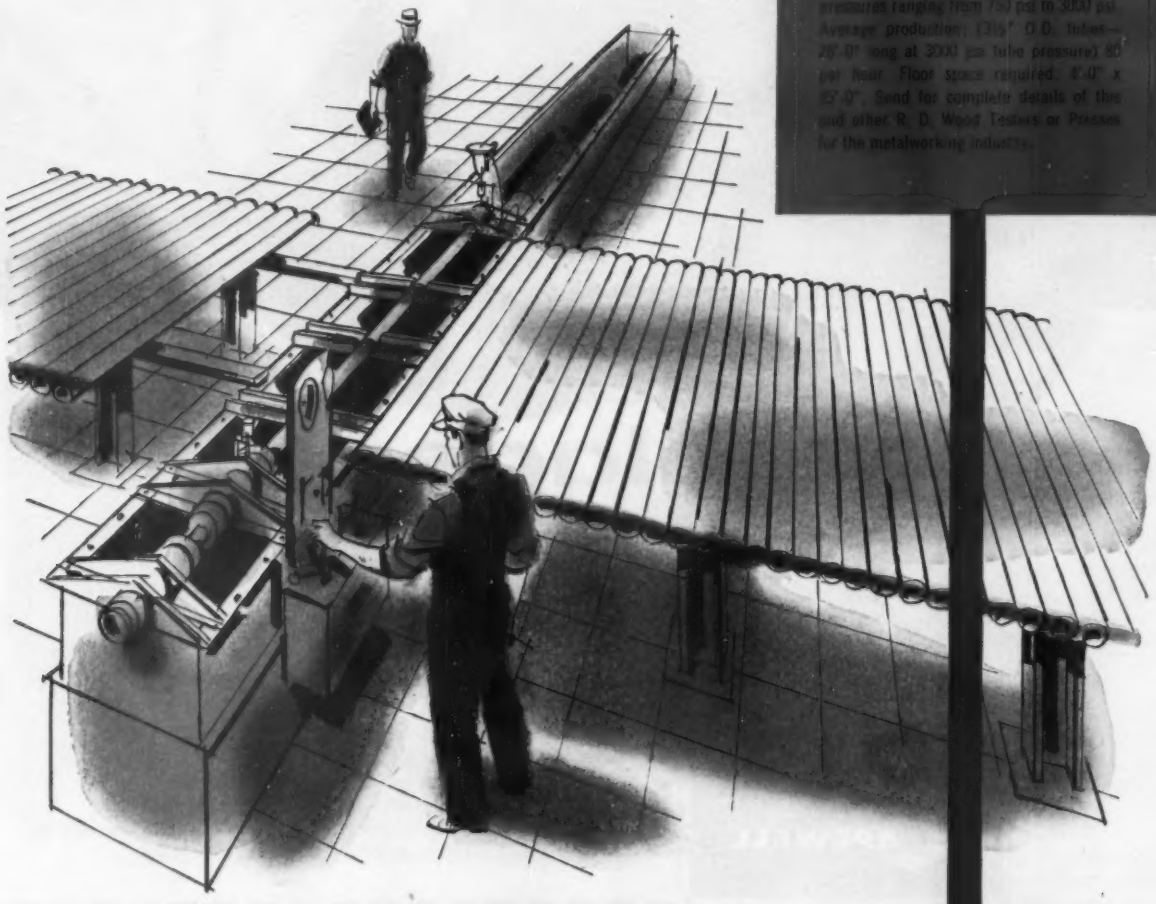
ment, has been made chief engineer.

Engineered for Performance

Put a Wood Tube Tester to work and get the money-saving advantages of smooth, dependable performance . . . long operation with low maintenance.

Reason: every Wood Tube Tester is the product of sound design, carefully selected materials, conscientious craftsmanship. This is why Wood Tube Testers and Presses are known throughout industry for their trouble-free operation and fast, economical production. R. D. Wood has many standard tube tester and press designs for a great variety of uses—and engineers others for special work. Write for our catalog and engineering information. No obligation, of course.

R. D. Wood Tube Tester for hydrostatically testing tubes or pipes in sizes from 1" to 4" O.D., lengths from 10'-0" to 26'-0", at test pressures ranging from 750 psi to 3000 psi. Average production: 1315" O.D. tubes—26'-0" long at 3000 psi tube pressure) 80 per hour. Floor space required: 8'-0" x 35'-0". Send for complete details of this and other R. D. Wood Testers or Presses for the metalworking industry.



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ASSA

ment, has been made chief engineer. His former assistant, **Ted Masaitis,** has been promoted to chief of the machine design section. **Anson Laufer,** assistant manager of the Cri-Dan Division, has been appointed divisional head; **John Montean** succeeds him.

John J Bachner, executive vice president and general manager of Chicago Molded Products Corp, has been elected president of the company. He succeeds the late **Marcel F Bachner.**

Charles E Smith, Jr, has been appointed factory manager of Flexible Tubing Corp, Guilford, Conn. Prior to joining the company he was chief industrial engineer at Singer Manufacturing Co.

C M Martenson has been elected vice president and general manager of Hydraulic Research & Manufacturing Co, Burbank, Calif, subsidiary of Bell Aircraft.

Glidden S Doman, board chairman of Doman Helicopters, Inc, Danbury, Conn, has assumed the presidency of the company following the resignation of **Donald B Waters.**

George R Quaile has been elected president of Pittsburgh Stencil & Tool Co.

Leon H Fish has joined Acme Precision Products, Inc, Dayton, as assistant to the president.

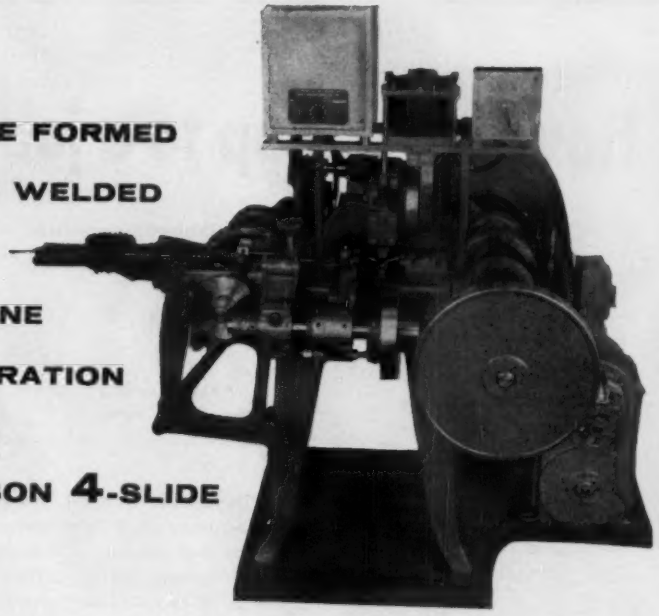
Joseph B Gutenkunst has been elected president, treasurer, of the Milwaukee Malleable & Grey Iron Works. He fills the post left vacant by the recent death of his brother, **Charles A Gutenkunst, Jr.**

Bertram A Kline has been elected assistant vice president and sales manager of the Birdsboro Steel Foundry & Machine Co, Birdsboro, Penna. He was formerly sales manager of the company's steel castings and miscellaneous machinery division.

Dalton H Miller has been appointed general manager of Industrial Tectonics' new special bearing plant in Compton, Calif.

Clee O Worden has joined Edgcomb Steel Co, Philadelphia, as manager of tool steel sales.

WIRE FORMED AND WELDED IN ONE OPERATION WITH NILSON 4-SLIDE



Garter loop formed and welded in one fast operation by Nilson 4-Slide.

Production is increased more than 25% by Hawie Manufacturing Company using a #1 Nilson 4-Slide with welding attachment which eliminates need for ferrule loops in the manufacture of hose supporters. .062 soft basic wire is formed with ends welded in one automatic operation at a conservative 105 pieces per minute. Additional savings are realized in eliminating cost of ferrule.

Another example — Drapery hook is formed with two wires entering 4-Slide simultaneously and automatically welded together at point of contact.

Nilson 4-Slides will produce many types of wire forms similar to the part shown here in which two pieces must be welded or otherwise closed together. By the mounting of automatic welding equipment on the 4-Slide, such parts can be produced in one fast, accurate operation at minimum cost. Nilson 4-Slide Wire Forming Machines are available in a wide range of sizes to handle basic steel wire from 1/32" to 1/2" diameter.

A.H. NILSON MACHINE COMPANY

1519 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

How to BAK*-up to a job...

with the newest precision tool in the Cogsdill Finishing Tool Family

* *The BakSink Tool*

. . . offers a rapid and direct access for cutting angles or radii on reverse surfaces . . . some back-facing and grooving operations.

Designed to offer micro-set accuracy within close tolerances, the BakSink tool is completely adaptable for production use as it requires no specialized equipment, spindle or workhead.

PRECISION COUNTERSINK FROM SPECIAL DESIGN

The production situation at left dramatizes but one of several applications of the BakSink tool. Let our Engineering Staff design this tool to fit your needs.

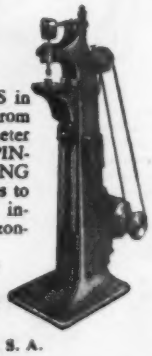
Contact our Engineering Staff regarding your particular production needs.

TOOL PRODUCTS, INC.
12890 W. Eight Mile Road Oak Park 37, Michigan

GRANT

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
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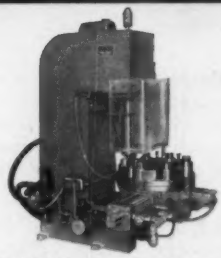
AIR-HYDRAULICS INCORPORATED

INCREASE PRODUCTION 50%



IT'S BEEN DONE—for a "big 3" auto company. Tooling shown increased production on press assembly of steering knuckles from 1200 to 1800 pieces per hour—with added operator safety.

COMPLETE SET-UP—#1405 Air Index Table, #C-300 5½ Ton Press, controls and fixtures were furnished by Air-Hydraulics, Inc. An electrical circuit synchronizes press and table for fully automatic operation on standard line pressures. Operator places pieces on fixture outside guard • Parts are indexed into position and pressed together • Assembly is removed automatically and chuted into container. Constant pressure throughout ram stroke has eliminated previous trouble caused by variations in stock thickness and other factors.

AIR-HYDRAULICS INCORPORATED

"EXPLODED AIR" IMPACT HAMMER

MORE STROKES / CU. FT. AIR / MINUTE

NO FOOLIN', when operated at 100 psi line pressure the Model Z-2, 12,000 lb. hammer illustrated will make 50 strokes per cubic foot of air. That's at a rate of 60 per minute on manual control or upwards of 120 on automatic. The Model Z-6, 40,000 lb. capacity hammer will punch out 15 strokes per cubic foot at the same rates.

EASILY ADJUSTABLE to any pressure within capacity, impact is then constant at any point in the stroke. Variations in stock thickness or improper positioning are handled without damage to work, dies or hammer.

FOR THOSE AWKWARD JOBS, from forming to forging, the head of the Z-2 may be purchased separately and mounted at any angle, even upside down.

AIR-HYDRAULICS INCORPORATED

202 HUPP AVE.,
JACKSON, MICHIGAN

VICTOR TORCH with cutting tip of Anaconda Tellurium Copper, which has the resistance to heat and wear required to maintain uniform flame characteristics through a long life of service.

Tellurium Copper makes better cutting and welding tips

Two typical Victor torch tips of Anaconda Tellurium Copper-127 shown full size.

THE PROBLEM: Victor Equipment Company of San Francisco first used regular leaded copper rod in making tips for its line of cutting and welding torches. In some applications, however, the leaded copper did not stand up under high heat conditions.

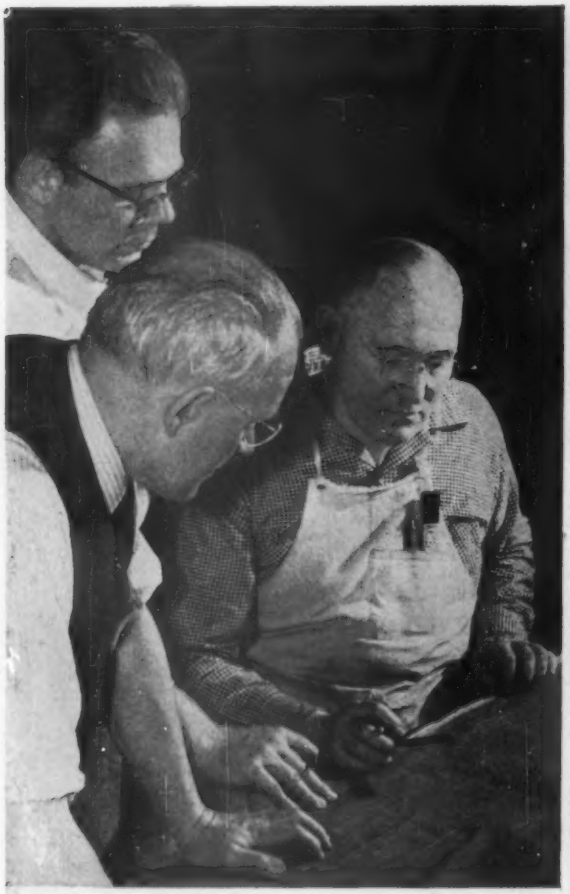
THE SOLUTION: Victor tried Anaconda Tellurium Copper-127 Rod and found the answer. The Tellurium Copper had a much higher heat resistance. This meant long, trouble-free service for its precision-made cutting and welding torches in all types of applications. At the same time, the Tellurium Copper provided uniform machinability, especially important in drilling the deep holes prior to completion by swaging on mandrels.

FREE TECHNICAL SERVICE: No matter what your special problem may be, The American Brass Company can very likely furnish free-cutting copper and copper-alloy rod to meet the requirements of the product or the operation.

It is the function of the Technical Department of The American Brass Company to assist metal users in the selection of Anaconda Rod. This service is at your disposal without charge or obligation. Comprehensive data on composition and machinability of standard Anaconda Rod Alloys, together with specification references, weights and dimensions, are available in Publication B-3. For this booklet – or technical assistance – write: The American Brass Company, Waterbury 20, Conn. 8708

ANACONDA® COPPER and COPPER ALLOYS

MADE BY THE AMERICAN BRASS COMPANY



it's a job for CDT

Faced with a special tooling job? Stymied by a tough problem? Would 50 years of experience help? Then the logical answer for you is to send it to Columbus Die-Tool! CDT specializes in tools, jigs, fixtures and also special machinery, designed and built to produce your products better, faster, and more economically.

That's why so many of the nation's leading manufacturers avail themselves of the specialized services of Columbus Die-Tool. Perhaps CDT can solve your tooling problem and help you make your product . . . better for less.

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AND MACHINE COMPANY

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ESTABLISHED 1906

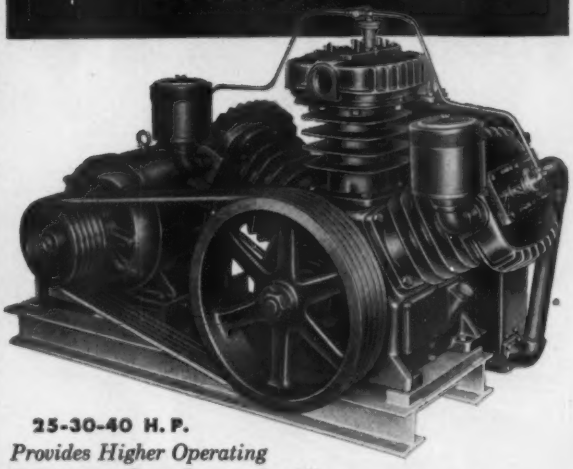
Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

CURTIS MODEL C-100

Two-Stage, Air-Cooled Air Compressor

Delivers *MORE* Air...

PER MINUTE HORSEPOWER KILOWATT HOUR OF ELECTRICAL ENERGY CONSUMED



25-30-40 H. P.
Provides Higher Operating Efficiency Costs Less to Install

The Curtis Two-Stage Compressor assures a saving in your power costs. It's air cooled, thereby eliminating expensive water bills—quick and easy installation with no complicated plumbing problems.

The new C-100 embodies all the well-known Curtis engineering features such as centro-ring oiling and Timken Main Bearings.

For complete information write for illustrated folder.

YOU CAN COUNT ON REMEMBER...

Curtis

OUR 103rd YEAR
MANUFACTURING COMPANY
PNEUMATIC DIVISION
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AIR HOISTS
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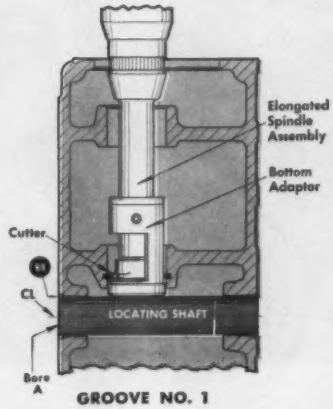
AUTOMOTIVE
AIR COMPRESSORS

PACKAGED AND REMOTE AIR CONDITIONING

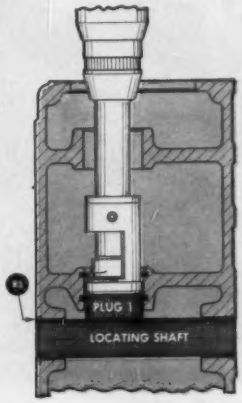
CM-21

Waldes Truarc Grooving Tool pays for itself with big savings on one small run!

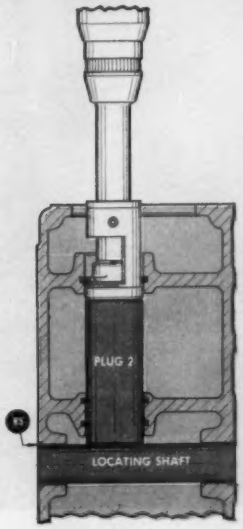
3 internal recesses cut in bores of 100 castings in 17.5 hours... including set-up time



GROOVE NO. 1



GROOVE NO. 2



GROOVE NO. 3

The job shown above called for three grooves located at prescribed distances from center-line CL of bore A. Depth and location tolerances: ±.0015".

Size and shape of the castings made nesting difficult for a boring bar operation. Exterior surfaces were unmachined, making alignment complicated. With two grooves over 7" from the housing's open end, boring bar chatter could have caused costly rejects.

To overcome these obstacles a Waldes Truarc Grooving Tool was equipped with an elongated spindle assembly and bottom adaptor. The tool was mounted in a drill press, the castings in a large vise. Grooves were then cut as follows:

Groove No. 1: A locating shaft was inserted into bore A as a reference surface and the tool piloted into the housing until the bottom adaptor banked on the shaft. The tool is designed so that the cutter rotates in a neutral position until additional downward pressure is applied. It then moves into cutting position until preset groove depth is reached, after which the tool idles. Release of pressure returns the cutter to neutral so that the tool may be withdrawn.

Groove No. 2: Plug 1 was inserted into the bore over the locating shaft and the tool again piloted into the bore. The groove was then cut the same way as Groove No. 1.

Groove No. 3: Plug 2 was substituted for the first plug and the cutting operation repeated.

All 300 grooves were held to prescribed tolerances. Set-up time: exactly 11 minutes. Operating time: 1050 minutes for 100 castings. Rejects: none!

No recessing problem is too tough for the amazingly versatile Waldes Truarc Grooving Tool. It's so simple even unskilled labor can use it accurately.

Write for a 20-page manual containing full information on Waldes Truarc Grooving Tool.

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GROOVING TOOL

U.S. Pat. 2,411,426.

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Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)

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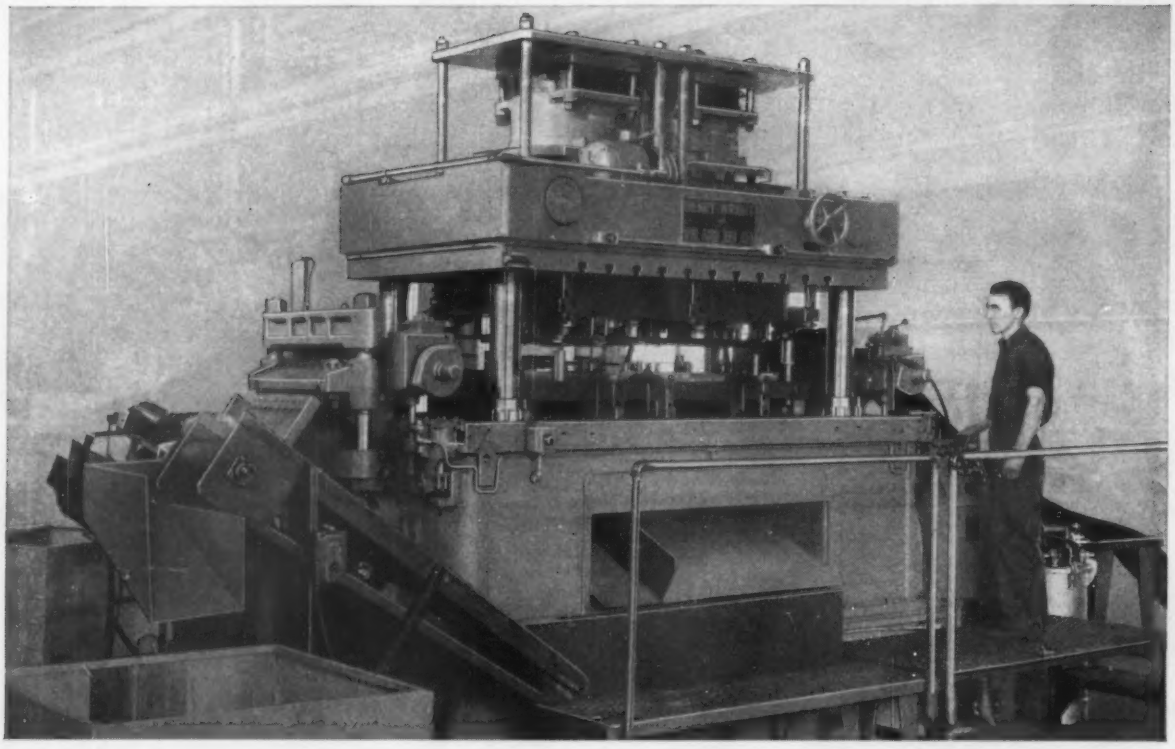


Henry & Wright Double Crank

"definitely improved our competitive position"

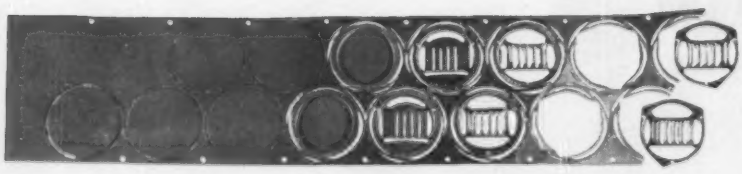
TO KEEP PACE with trends in progressive stamping, Grand Haven Stamped Products Co., Grand Haven, Mich., bought a 100-ton Single Crank Henry & Wright in 1954. Its performance was so impressive, Grand Haven purchased a 200-ton Double Crank in 1956.

ON VERY FIRST JOB the new machine equalled expectations. The part involved — an automotive vent grill — is produced two at a time on a multi-station die from a 15⅝" strip of 22-gauge, cold-rolled steel, at 124 pieces per minute.

THREE OR FOUR conventional presses would have been required to produce this part, it is estimated by Emil Gaul, Grand Haven vice president. Among the features he likes about the Double Crank are: unequalled flexibility afforded by the large bed area, rapidity of die change, inching control and safety devices.

"Definitely improved our competitive position," is the way Mr. Gaul sums up the performance of his Henry & Wrights. They can improve productivity and work quality in your plant, too. Write for our catalog.

HENRY & WRIGHT
Division of Emhart Mfg. Co.
Hartford, Connecticut



Six- and seven-station twin die lances, flattens, draws, pierces, forms and blanks out.

THEY'RE BOTH TWO DIAMETER DRILLS . . .

BUT WHICH ONE SHOULD YOU USE?

STEP TOOLS VS. SUBLANDS

Manufacturing Accuracy:

Subland tools are turned, machined, ground and faced—all operations between centers for ultimate accuracy. Step tools are checked in single collet and ground to approximate desired size.

Maintenance:

Subland tools incorporate separate lands for each diameter—thus they can be accurately resharpened many times. Step tools must be remade during sharpening procedure—losing concentricity and continually weakening tool.

Performance:

Subland tools are built right to work right. They perform their precision operations flawlessly because they are accurately designed. They cost slightly more than standard tools—but they outlast them many times.

Results:

Tool test reports prove conclusively that Sublands out-perform standard or step type tools on practically all continuous, multiple drilling operations.

Versatility:

Subland tools can be made to accurately and dependably perform any practical number of operations—simultaneously! Accordingly, they pay for themselves in time, tools and equipment.

A MOHAWK SUBLAND . . . *NATURALLY!*

Mohawk Subland Drills are the modern answer toward faster, more accurate, economical combination tooling operations plus amazing production saving.

Why stock heavy inventory of widely varied step type tools for consecutive drilling operations? One pass with a Mohawk Subland Drill will do the work of two, three, four—or more—*ordinary* drills because Sublands last longer . . . stay accurate through multiple regrinds . . . and reduce hole costs.

A Mohawk Subland is the one versatile tool that will quickly pay for itself in man hours, equipment and tool dollars. They're immediately available in an amazing range of "Off-the-Shelf" Size-Optional sizes and types for every conceivable drilling combination. Highly specialized types are also readily available.

Write . . . Wire . . . Phone . . .

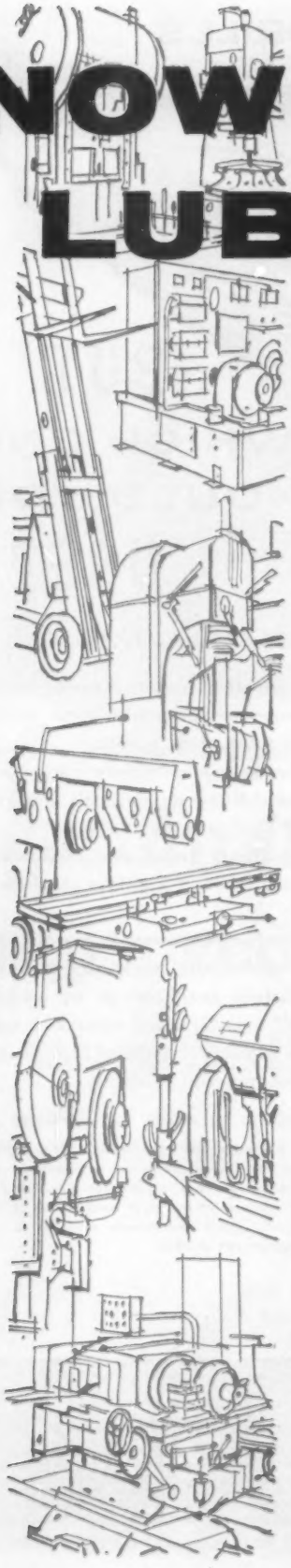
today for your Mohawk Subland Tool Catalog and/or the new brochure on Sublands vs. Step Tool operations. They're yours for the asking . . . and if you are interested in combination drilling operations, you'll find dozens of ways to save your equipment dollars.

NORMAL DELIVERY ON MOHAWK SIZE-OPTIONAL SUBLANDS—ONE WEEK FROM RECEIPT OF ORDER!

world's largest producers of Sublands

Montpelier, Ohio

NOW! ATLANTIC LUBRICANT 54



...the one lubricant for practically every industrial need

New Atlantic Lubricant 54 is industry's closest approach to the universal grease lubricant. The use of this distinctively purple grease in your plant practically assures the correct choice in any application. It has given outstanding performance in all types of machinery.

Every shop, large or small, can make economical use of Atlantic Lubricant 54 because it gives

- ... multiplicity of use—reduces chance for error, cost of warehousing, and handling
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- ... excellent lubrication performance from very low to extremely high temperatures
- ... unusual stability against oxidation and softening under rugged working conditions
- ... positive identification due to its purple color

This product is available from warehouses conveniently located throughout Atlantic's marketing territory and may be ordered through the nearest office listed below.

ATLANTIC

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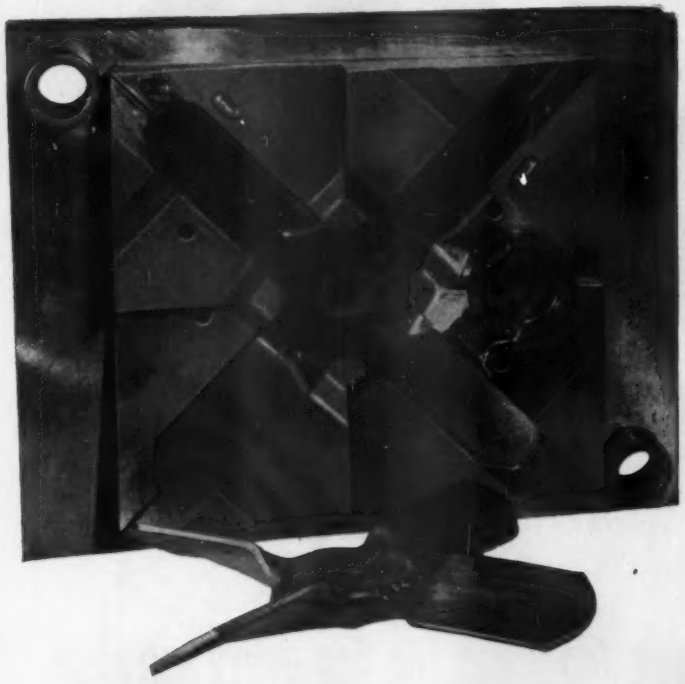
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



They're Using Cr-Mo-W Die for Fan Hub Part

Economy and long service life were the chief reasons that led Production Die Casting Company, Houston, Texas, to select Bethlehem Cr-Mo-W tool steel for the manufacture of this hub for an attic fan.

The two-part die, with Cr-Mo-W (chrome-moly-tungsten) used for both sections, is approximately 16 in. x 18 in. The part is cast of aluminum alloy, at 1250 F. Engineers at Production Die Casting Company say, "Performance of this die has been excellent. It has provided long, satisfactory service life."

Cr-Mo-W is an ideal tool steel for applications involving drastic changes in temperature, where heat-checking and shock are a problem.

Cr-Mo-W is our general-purpose type of hot-work tool steel. It hardens in air, and has good red-hardness and good machinability. Your Bethlehem distributor carries it in stock, in sizes to meet your needs.

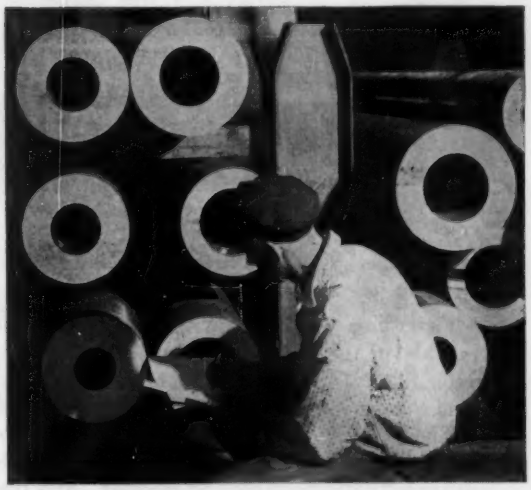
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Smooth Finish in Grinding Improves Tool Life

A smooth ground finish on tools with a cutting edge is essential to good tool life. This was proved recently in an application involving the use of our Lehigh H tool steel in a rotary slitting knife.

In normal operation on hot-rolled strip these knives cut about 8000 tons per edge on the original grind. But after being reground in the mill, production dropped to about 3000 tons per edge. Investigation revealed that the reground finish was rough and coarse, which meant in effect that the cutting edges were already dulled before being used in service. When the same knives were properly reground with a smooth finish, production again averaged 8000 tons per edge.

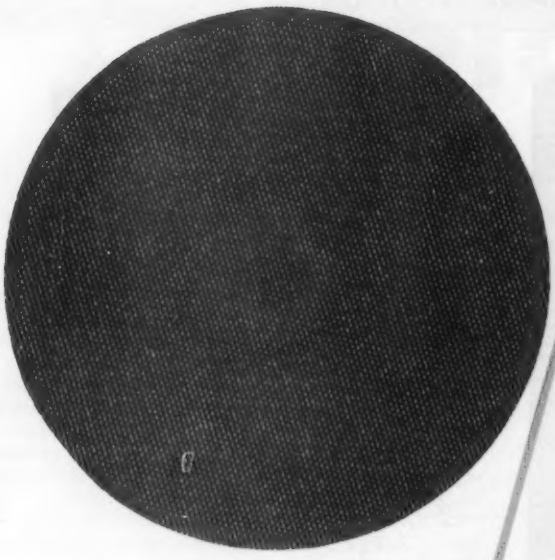
Generally, a smooth ground finish of from 10 to 15 micro-inches on a profilometer is satisfactory for good cutting-edge performance. In the event that coarser finishes are used, you may find production decreased.



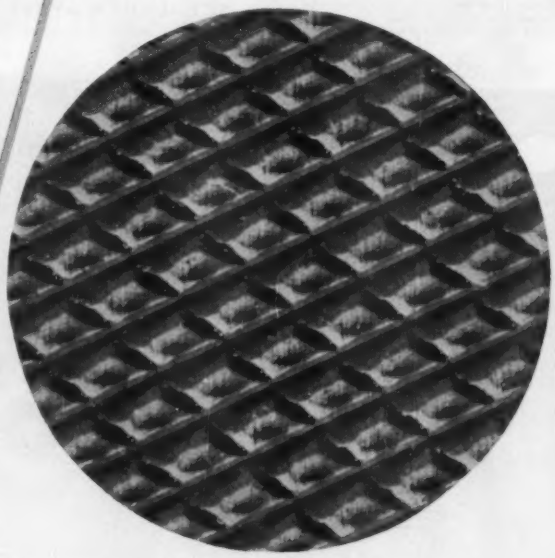
"HOLLOW-BAR" IN TWO TYPES

Bethlehem Hollow-Bar Tool Steel is now made in two types: BTR (Bethlehem Tool Room, oil-hardening), and Lehigh H (high-carbon, high-chrome). Hollow-Bar is made by a high-speed trepanning process, by which hammer-forged or hot-rolled bars are cored out, then rough-turned on the outside. Hollow-Bar is an ideal time-saver on hardened bushings, ring dies, draw-rings and the like because the steel can be put right to work. There's no need to wait for forged rings or discs.

For the finest jobs...or the roughest jobs



Tooth pattern of Nicholson-made Swiss Pattern Square Handle Needle file, Cut No. 6, magnified approximately five times.



Tooth pattern of Nicholson-made 18-inch Flat Bastard file magnified approximately five times.

There is a Nicholson and Black Diamond file for every purpose

Examine these close-ups carefully. They show several important points.

First, they indicate that Nicholson-made files are available in the widest spectrum of cuts. The cross section at left is magnified from our X.F. (*Extra Fine*) Swiss Pattern Square Handle Needle file, Cut No. 6, the finest cut we make. Our X.F. files are primarily finishing tools, used by tool and die makers, delicate instrument parts finishers and jewelers. And there are *seven* separate degrees of fineness instead of the three usually found in conventional American pattern files.

The section at right is from our 18-inch Flat Bastard file. This rugged tool is used by machinists, ship and engine builders, repair men—any worker who wants to take off a lot of metal in a little time.

Secondly, notice the uniformity of tooth structure. It's just as uniform in the fine Swiss Pattern cut as it is in the big Flat Bastard. That means topnotch workmanship by Nicholson . . . and topnotch results in your shops. Always specify Nicholson or Black Diamond files.

NICHOLSON U.S.A. **NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND** BLACK DIAMOND U.S.A.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILE COMPANY

World's foremost manufacturer of A FILE FOR EVERY PURPOSE

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities
By John S. Davey

Tighten bolts to yield strength?

Actually, it is safer to "overtighten" than to undertighten. The following explains why.

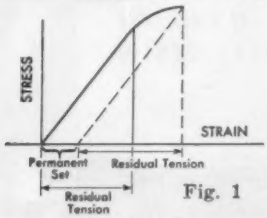


Fig. 1

Up to yield point, the strain in a bolt is proportional to stress. *Beyond* the elastic limit, the bolt goes into its "plastic range". Some permanent stretch takes place. (Fig. 1). Yet while the bolt will not return to original length, note that *residual tension* is fully maintained. And remember, it's *this* force that keeps a bolt tight, determines joint strength.

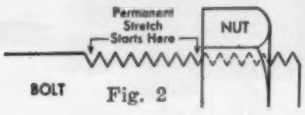
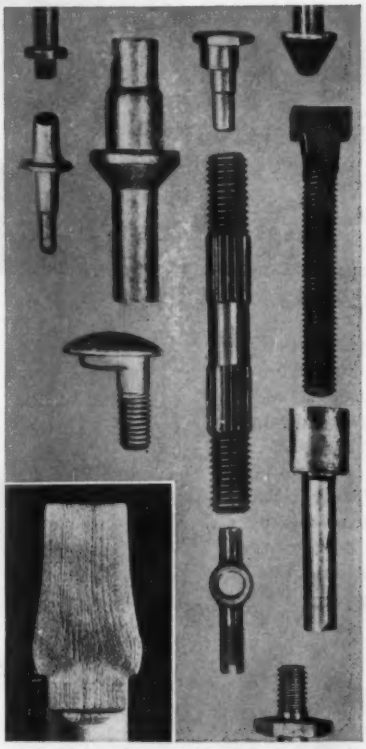


Fig. 2

The permanent set starts at section with highest unit stress —which is at the unengaged threads (Fig. 2). Ultimately, this throws thread pitch off and nut locks, subjecting bolt to torsion (rather than further tightening). This force disappears with wrench-removal. Thus, a bolt can even be torqued well into its plastic range if it won't be reused or need adjustment.

Cold facts on cold headed fasteners



RB&W cold heading machines have forced metal to flow into this typical variety of shaped pieces—just a handful of thousands of different cold headed shapes produced by RB&W to specification. The upset can be at any point, and the shape need not be symmetrical. The continuous, symmetrical flow lines (inset) make metal stronger.

NO ATTEMPT to simplify, improve or economize on fastening is complete without a good look at your screw machine parts, forgings, and certain assemblies that can be reduced to one piece.

You would be surprised at what an expert can produce on cold headers with complete uniformity. Cold heading produces in one piece parts that would otherwise be two or more.

BETTER FLOW LINES

Just as it does with standard fasteners, cold heading makes possible a higher quality, stronger product at high speed and low cost. Properly done, the operation upsets metal along its own axis in continuous flow lines without folds. Stress patterns are better. Fasteners and parts gain greater shear, impact and fatigue strength.

Long a specialist in cold headed fasteners, RB&W offers its experience to designers and production men who want to know whether cold heading is feasible for specific mechanical shapes. If it proves to be so, RB&W facilities can handle your volume needs. Contact Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Spin-Lock® Screws solve assembly problem

Spin-Lock "tooth" about to bite in. Head meets seat when fully tightened.

The designer specified countersunk-head screws to be used in a particular casting. The production man had to stake these in to anchor them. But this meant extra operation, made screw removal damaging and difficult.

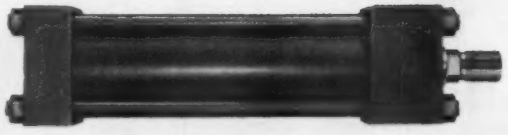
The answer was found in Spin-Lock screws. These have hardened "ratchet-action" teeth that bite in when tightened, take 20% more torque to loosen than to tighten, can be reused. Send for Bulletin.

Five cylinder series... each the best of its kind!

Here you see one more reason why experienced cylinder users prefer Hannifin cylinders...there is a Hannifin cylinder series for every type of service.

What pictures cannot show you is the extra effort that goes into every Hannifin cylinder, all the way from the drawing board to the shipping dock. This brings you design features other cylinders simply do not have...superior workmanship where it's most needed for long, trouble-free service...and better delivery promises, better kept. All at prices no higher than you may have been paying for less satisfactory cylinders.

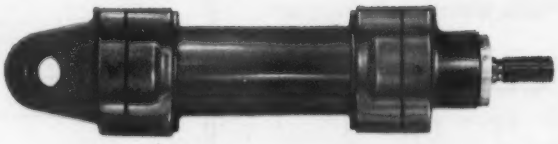
There's a Hannifin man near you—or, if the need is urgent, call us long distance. He or we will welcome the opportunity to help you as you select the Hannifin cylinder series that best meets your needs.



AIR AND HYDRAULIC

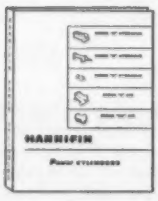
HANNIFIN

POWER CYLINDERS



COMPLETE CYLINDER FILE

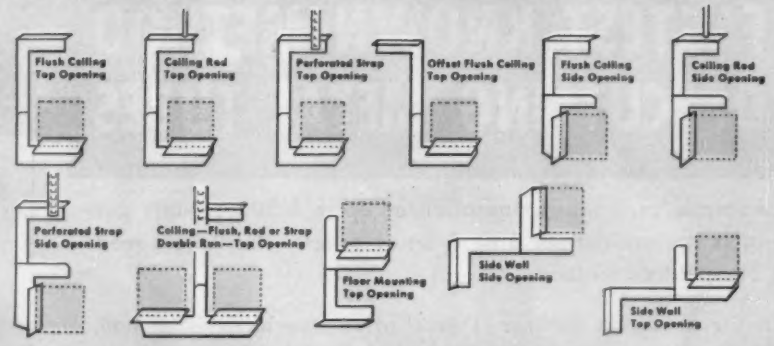
Write for your copy of this new Hannifin Cylinder File...complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Write Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois.



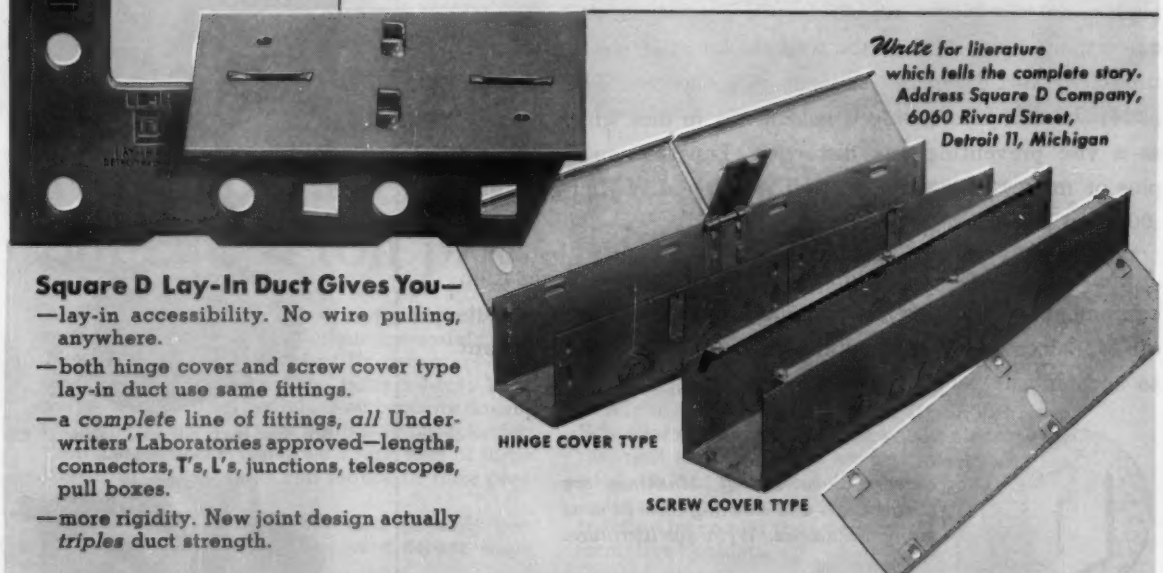
SQUARE D's NEW HANGER

MAKES THIS LAY-IN DUCT STRONGEST— FASTEST AND EASIEST TO INSTALL!

HERE ARE 11 OF THE MORE THAN 20 WAYS YOU CAN HANG SQUARE D WIREWAYS!..


Flush Ceiling Top Opening
Ceiling Rod Top Opening
Perforated Strap Top Opening
Offset Flush Ceiling Top Opening
Flush Ceiling Side Opening
Ceiling Rod Side Opening
Perforated Strap Side Opening
Ceiling—Flush, Rod or Strap Double Run—Top Opening
Floor Mounting Top Opening
Side Wall Side Opening
Side Wall Top Opening

Write for literature which tells the complete story. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan



Square D Lay-In Duct Gives You—

—lay-in accessibility. No wire pulling, anywhere.

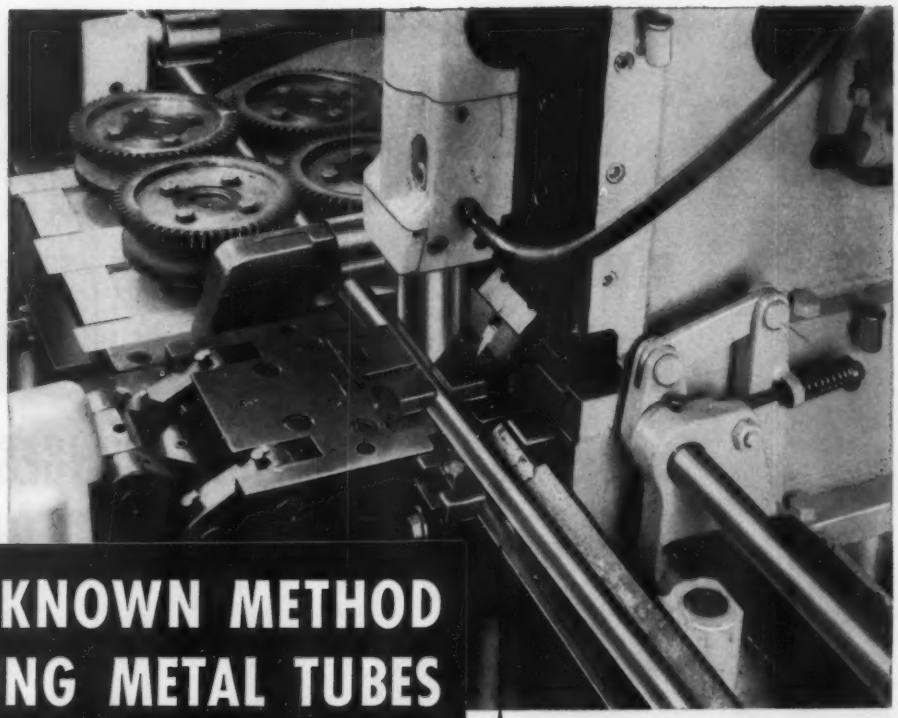
—both hinge cover and screw cover type lay-in duct use same fittings.

—a *complete* line of fittings, *all* Underwriters' Laboratories approved—lengths, connectors, T's, L's, junctions, telescopes, pull boxes.

—more rigidity. New joint design actually *triples* duct strength.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY



FASTEST KNOWN METHOD OF CUTTING METAL TUBES

Automatic continuous operation of up to 6,500 cut-offs per hour is approximately 3 to 8 times greater than the speed of competitive methods.

Cutting action in Grieder Tube Cut-off Machines is accomplished by two blades actuated by a crankshaft. A horizontal cut is made first, through the wall thickness of the top of the tube. The vertical blade descends into the opening and completes the cut. The tubing is held firmly in dies which operate as a vise preventing any distortion. Lengths can be held to plus or minus .002″ on light wall tubing and to approximately .003″ on heavier wall tubing.

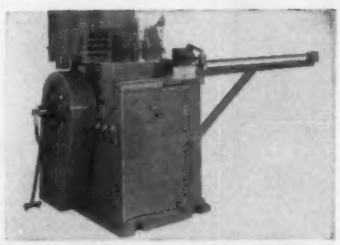
Automatic hoppers for feeding tubes and related automation equipment are available in conjunction with Grieder Tube Cut-off Machines for specific applications. Tell us what you want to accomplish.

Grieder Tube Cut-off Machines are slicing tubes and slashing costs in most major industries. Write for literature.

GRIEDER INDUSTRIES, INC.

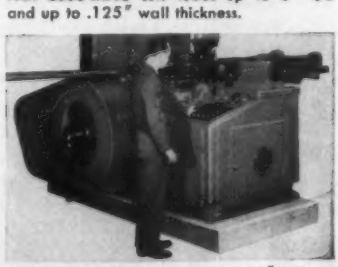
P. O. BOX 169, BOWLING GREEN, OHIO

THREE STANDARD MODELS

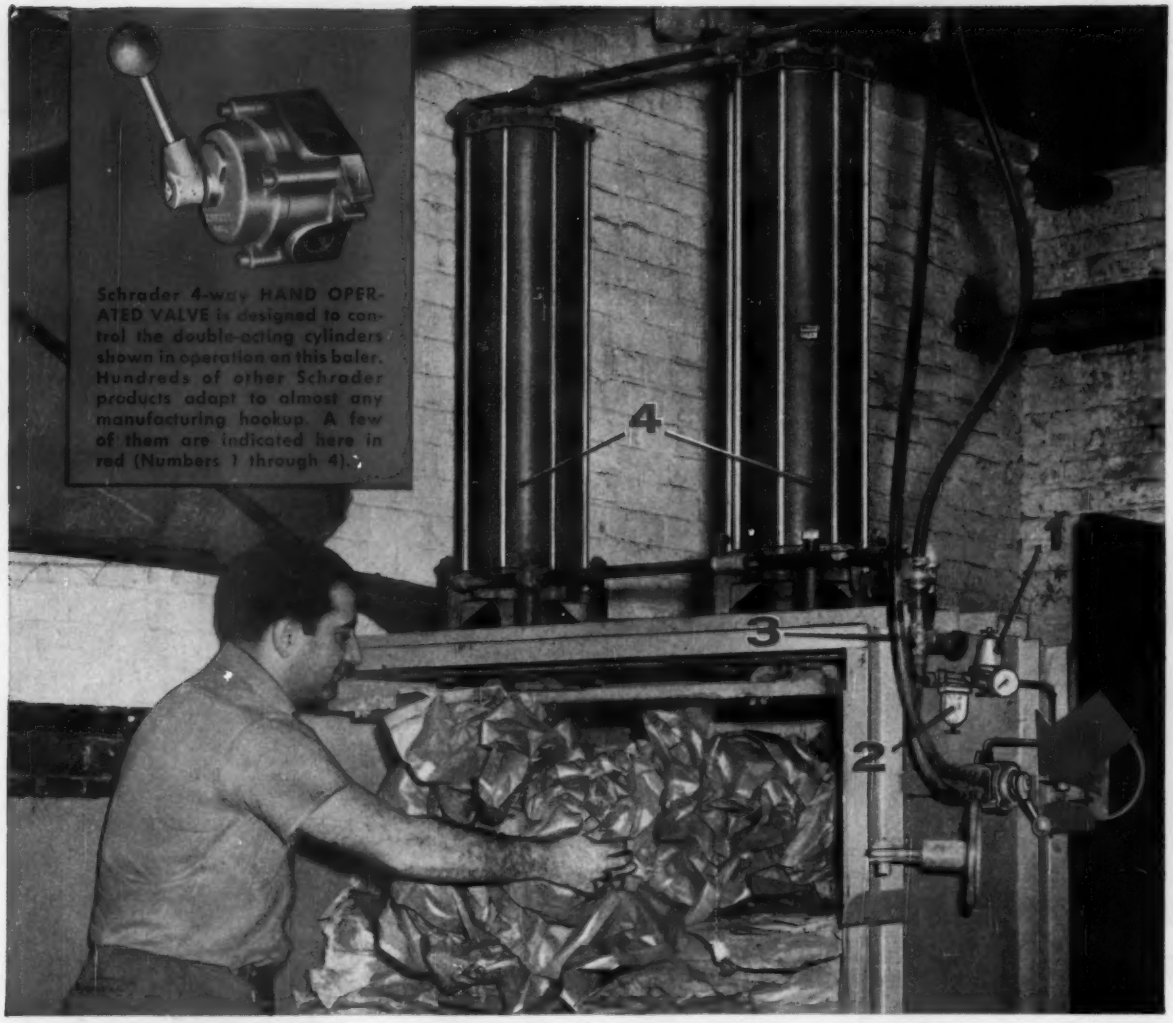


NO. 1000-MAC cuts tubes up to ¾″ OD and up to .062″ wall thickness.

NO. 2000-MAC cuts tubes up to 2″ OD and up to .125″ wall thickness.



NO. 4000-MAC cuts tubes up to 4″ OD and up to .250″ wall thickness.


Schrader 4-way HAND OPERATED VALVE is designed to control the double-acting cylinders shown in operation on this baler. Hundreds of other Schrader products adapt to almost any manufacturing hookup. A few of them are indicated here in red (Numbers 1 through 4).
4
3
2
1

How Schrader Air Products bale paper, producing 4 ton pressure with 100 lbs. of air

At this Rhode Island dye works, the paper baling operation formerly was a fatiguing manual chore. Now, the operator simply fills the press with used paper and cartons, and pulls a 4-way hand valve. One hundred pounds of air pressure flowing through the two Schrader double-acting cylinders then compress the paper with four tons of force. Finger-tip adjustments can reduce or raise pressure quickly, easily.

Safe, simple, fast—compressed air daily performs miracles in hundreds of different ways. More and more manufacturers think "air" when they think "automation." Holding work, moving scraps, synchronizing actions—all such operations can be automated with Schrader Air Products.

Air means economy, too. Upon request, Schrader engineers will assist you in planning for the most efficient use of air and in selecting the products best suited to your applications. Tell us your problems. We'll be glad to help. Or send for the latest informative booklets.

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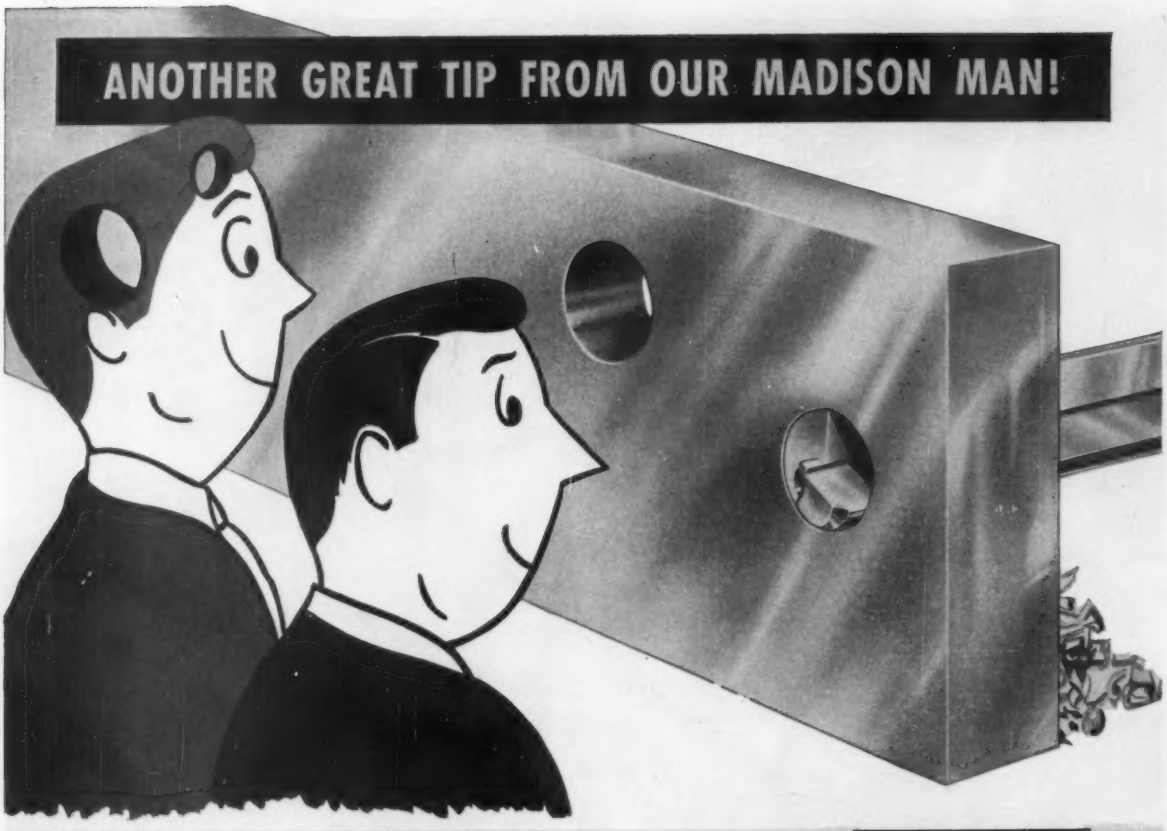
ESTABLISHED IN 1844

A. SCHRADER'S SON
Division of SCOVILL
460 Vanderbilt Avenue, Brooklyn 38, N. Y.

FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL

ANOTHER GREAT TIP FROM OUR MADISON MAN!



GUN DRILLS FOR CONVENTIONAL HOLES!

"He told us they'd be **faster** and they are . . . We're doing the operation in less than half the time. He said we'd need **fewer passes**, and he's so right . . . we now get a **finished hole** with *one pass!* Our tolerances are closer and our surface finish better than ever before . . . in less time and at much lower cost."

If you are interested in cutting conventional drilling costs with Madison Gun Drills, write for our new literature that tells exactly how. And let your Madison man advise you on other hole problems, too. He'll advise the **right** tools for every job. He **knows** 'em all — because he **has** 'em all! *For further information write Dept. AM-4.*

Let the man with the holes in his head tell you how to cut costs in:

- ★ **Boring**
- ★ **Reaming**
- ★ **Deep Hole Drilling**
- ★ **Trepanning**
- ★ **Roller-Burnishing**
- ★ **Gaging**

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Dept. AM-4.

☐ Please send me literature on Madison Gun Drills.

☐ Have representative call.

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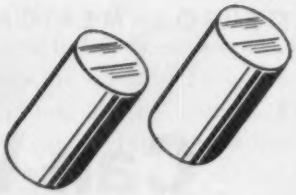
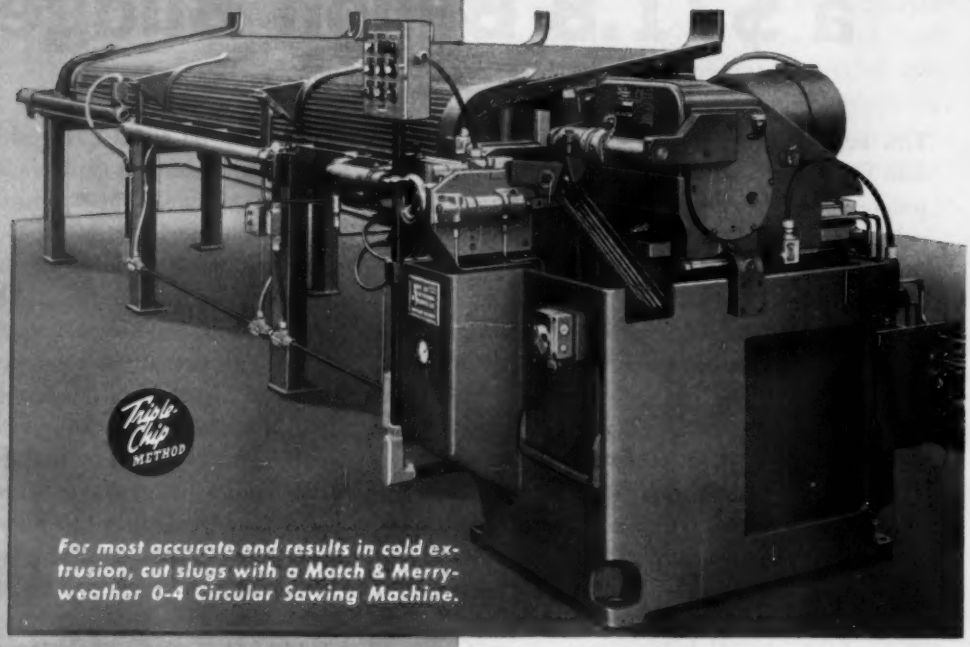
cold cuts



BY MOTCH & MERRYWEATHER



For most accurate end results in cold extrusion, cut slugs with a Motch & Merryweather 0-4 Circular Sawing Machine.

. . . make better COLD EXTRUDED PARTS

The Motch & Merryweather No. 0-4 Precision Circular Sawing Machine is automatic from the storage table to the finished cut slug. It cuts slugs accurate to ±.002" with uniformly square ends and minimum burr. Give your cold extrusion press the opportunity of producing more work than ever before, with more accuracy than ever before, at a lower cost per piece than ever before.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Automatic Precision Cut-Off, Milling and Special Machinery

A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

Can We Afford a $71.8 Billion Budget?

THE BUDGET submitted to Congress by President Eisenhower for the year beginning July 1 proposes federal spending of $71.8 billion. In only four years, three during World War II and one during the Korean War, has the government spent more. Under the proposed budget the government expects to collect $73.6 billion, mostly through individual and corporation income taxes.†

The principal reason for the size of the budget and for this year's increase is an expanding defense program. About 60% of all budget expenditures in the coming fiscal year will be for national security programs. Moreover, this area accounts for about 90% of the proposed increase in federal spending. In addition, as the chart shows, there are large expenditures proposed for purposes other than defense.

Continued budgets of this size, some contend, will lead to inflation and wreck our economy. It has been suggested that they might lead to "a depression that will curl your hair." Yet many insist that the budget, large as it is, still is inadequate in many respects — for defense, schools, agriculture, small business, health, research, indeed, for almost every activity in which the government has become involved.

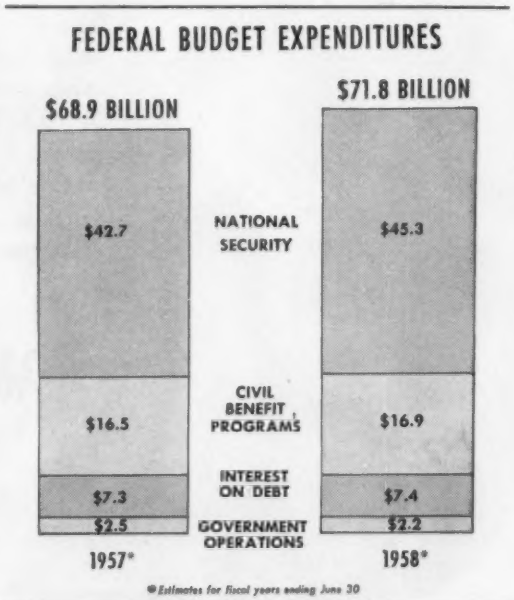
Is It Really Too Big?

Actually, the proposed budget would place no greater burden on the economy than any budget in the last six years, because our economy has been growing. Federal spending per capita under the proposed budget will be about $416, or $10 more than this year; but our per capita income rose almost $80 last year. And, because of our increasing population, next year's expenditures will, in fact, amount to *less* per capita than in 1954 when federal spending was $4 billion lower.

Another way of measuring the burden of government expenditures on the economy is to compare the purchases of goods and services of all branches of government — federal, state and local — with the total output of the nation. The share of our national product taken by government this year will be about the same as in the past two years and, furthermore, about the same as the average for the past 28 years.

By the standard of any recent year, the budget is within the means of the American economy. In this sense, we can "afford" it. But the pros-

†*These figures refer to the regular federal budget and do not include operations of trust funds, primarily for social security programs and the new federal aid program for highways, which are financed by special taxes.*



pect of steadily increasing budgets, requiring 20% or more of our national income, introduces another threat.

The Real Threat

Large and rising budgets that do not balance government spending with higher tax collections clearly would be inflationary and would destroy the value of the savings and income of all who lagged in the race with climbing prices. But serious dangers will still exist even if our budget continues to be balanced, as this year's is.

- **Budgets that require a large take in taxes eat up the savings required to finance private industry.** What the taxpayers must give the government they cannot save. This deprives private industry of the savings and resources needed to expand and modernize producing facilities.
- **High tax rates also undermine the incentive to save and invest in normal business enterprises by taking such a large share of any income gained.** Taxes on corporation income now take 52% of all income over $25,000. And taxes on individual incomes can take as much as 90% of earnings that remain after this 52% bite.
- **High taxes encourage, on the part of both individuals and corporations, the search for "gimmicks" and special treatment.** As a leading character in Cameron Hawley's novel *Executive Suite* observed: "To a far greater degree than most people realize, income tax has become a primary governing factor in corporation management." Indeed, it is only because of the numerous gimmicks and special provisions now available that high tax rates have not already inflicted greater damage to economic incentives.

These dangers comprise the real threat of large and rising federal budgets. It is a threat to continued growth of our economy, and it is no less a threat merely because the budget is technically in balance.

What Should Be Done?

In attempting to hold government spending within reasonable bounds, we should *not* hold back on needed civilian programs. The heavy demands now being urged at all levels of government for roads and schools, for instance, are largely the result of failure to keep pace with the growth of the country. Furthermore, we cannot cut provisions for national security below the minimum level of safety. And unhappily, defense in the rocket and missile age is fantastically and ever increasingly expensive.

What we *can* do is enforce some financial discipline on our military leaders, and hold down our defense expenditures by making sure their demands are justified and by requiring efficiency. In the civilian programs, though some need to be increased to serve a growing economy, we can eliminate the outright waste.

A More Difficult Job

We must also do something far more difficult, and that is to reduce federal programs of aid to special groups at the expense of all the taxpayers. The new budget calls for over $5 billion for veterans, and another $5 billion for farmers. A number of industries and areas stand to receive aid in large amounts based less on necessity than on political pressure. These demands for increased aid, year after year, must be resisted if we are to have any hope of stopping a relentless rise in our budget.

Then, as our national income increases, we can look forward to reducing tax rates and providing greater incentives for the private sector of the economy. **Only in this way — by keeping government spending in line with economic growth — can we prevent our federal budget from being a crippling burden.**

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT
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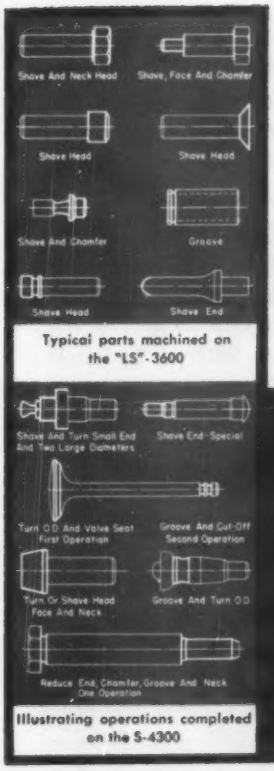
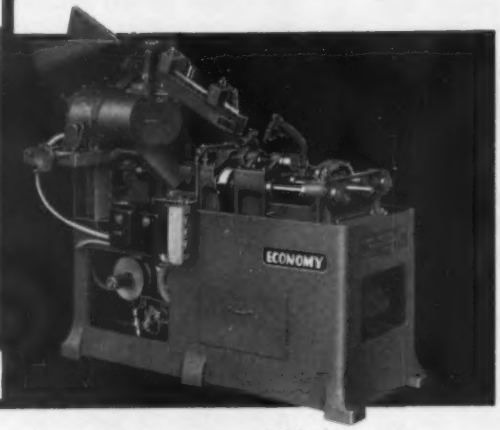

Shave And Neck Head
Shave, Face And Chamfer
Shave Head
Shave Head
Shave And Chamfer
Groove
Shave Head
Shave End
Typical parts machined on the "LS"-3600
Shave And Turn Small End And Two Large Diameters
Shave End-Special
Turn O.D. And Valve Seat First Operation
Groove And Cut-Off Second Operation
Turn Or Shave Head Face And Neck
Groove And Turn O.D.
Reduce End, Chamfer, Groove And Neck One Operation
Illustrating operations completed on the S-4300

Face, Turn, Groove, Neck, Cut-off and Burnish BOLTS, AUTOMOTIVE VALVES, PROJECTILES & SIMILAR PARTS Automatically at High Production Rates on ECONOMY Automatic Shaving Machines



ECONOMY Automatic Shaving Machines are available in two sizes — the "LS"-3600 for body diameters up to ½" and lengths under heads from ½" through 4½" — the S-4300 for body diameters up to 1" and lengths ¾" to 6" under heads. Production rates for the standard "LS"-3600 range from 800 to 2400 finished parts per hour and the S-4300 from 450 to 1800 per hour.

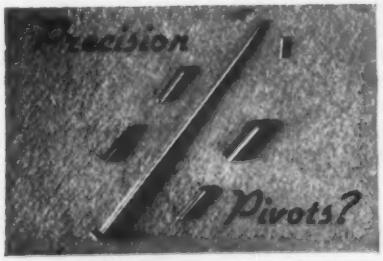
Machines are fully automatic and parts flow from hopper to work pan. Simple adjustments plus easy, rapid set-ups enable operator to operate several machines.

For the ultimate in accuracy, high production and low costs investigate ECONOMY Automatic Shaving Machines.

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
Automatic Pointing & Threading Machines
Double End Automatic Pointing Machines
Automatic Pointing Machines
Semi-automatic Pointing Machines

THE ECONOMY ENGINEERING CO.
WILLOUGHBY, OHIO
WILLOUGHBY-OHIO
Designers and Manufacturers of Secondary Operation Machines since 1915



The "spike" in the center is a common pin. The others are VK precision pivots.

Call VK

Steel, chromium plated, or carbide precision pivots to .013" diameter. 1 RMS or finer surface finish. Diameter tolerance to .000010". Chamfers, radii, lapped ends, etc.

Also volume production lapping of flat or round production parts.

Send us your specifications.

The VAN KEUREN COMPANY
176-C WALTHAM ST. WATERTOWN, MASS.

CHILE	COLOMBIA	PERU	ARGENTINA
SPAIN	PORTUGAL	SO. AFRICA	SWEDEN
ISRAEL	JAPAN	BELGIUM	MEXICO
INDIA	AUSTRIA	BRAZIL	CANADA
ITALY	GERMANY	URUGUAY	ENGLAND
DENMARK	FINLAND	FRANCE	U. S. A.

24 NATIONS UNITED... on Choice of Yoder Mills for Pipe and Tube Manufacture

It all started less than two decades ago with the introduction by Yoder—and the rapid adoption by American industry—of a revolutionary new type of mills for cold forming and electric-resistance welding of pipe and tubing. England, France, Italy, Mexico, Argentina, and Brazil soon followed the U.S.A. in adopting these mills. Other countries boasting any kind of modern metal working industry did likewise, even including distant Japan, India and South Africa. Production, depending on requirements, varies from 25,000 up to 75,000 feet per 8-hour shift.

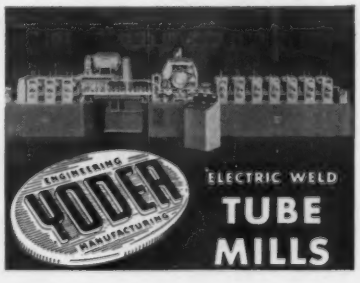
●

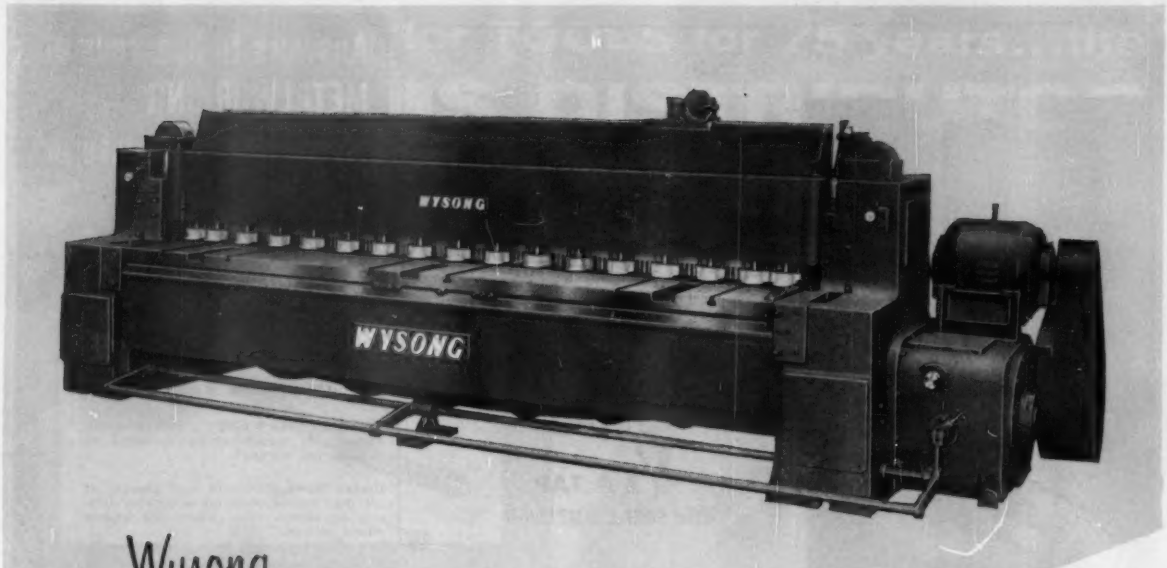
By this time, England, Italy and Argentina each have a total of ten Yoder mills in operation; Brazil, eight; Mexico, six; France, five; other nations somewhat in proportion to their population. In many nations, Yoder mills now supply from 50% to 90% of all welded tubes used. Several oustanding production records have been scored by operators in foreign countries, most recently in Italy. Reasons: the simplicity of design, ease of operation and dependability of Yoder mills. Secondly, generous assistance rendered by Yoder in training operators everywhere.

●

Through technological advances, Yoder leadership in tube mill design has been jealously maintained and strengthened from year to year. Ask for literature giving details of the latest improvements. Correspondence invited.

THE YODER COMPANY
5519 Walworth Ave. • Cleveland 2, Ohio, U.S.A.





Wysong
Squaring Shears
are

Wysong No. 1225, capacity ¼"
mild steel, cutting length 12 feet.

RUGGED to resist shock and pounding

RIGID to maintain accurate alignment

The primary function of Wysong Shears is to give you maximum production with unsurpassed accuracy — day after day, month after month. Their massive hi-tensile castings assure greater resistance to deflection. Their extra large, accurately machined bearing surfaces prevent twists and binds.

Holddowns provide all the power needed for positive clamping of stock — yet, are easily adjusted to prevent marring soft metals or polished sheets.

Ball-bearing, precision back gauges are designed and built to withstand the impact of volume shearing. Easily adjusted to compensate for eventual wear.

Automatic lubrication is standard on larger models — one-shot lubrication on smaller models.

Safety features include totally enclosed clutch and gears, adjustable stationary finger guards, non-repeat unit and treadle lock.

Simplicity of operation and superior design are keys to low maintenance and low down time.

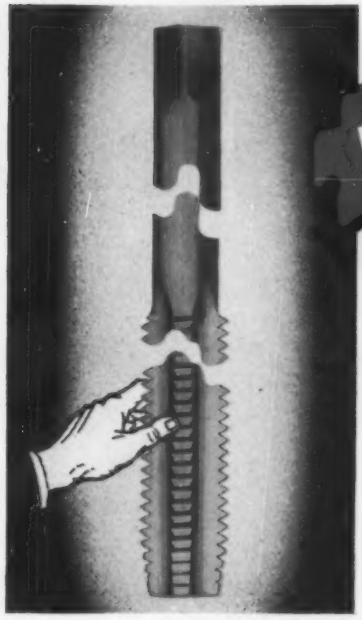
Power models are available with cutting lengths from 48 inches through 12 feet — capacities from 16 gauge through ⅜" mild steel.

For greater accuracy, larger volume, easier operation and the finest in design — Buy a WYSONG . . . It's MILES Ahead!

Buy A Wysong ... It's Miles Ahead

WYSONG

Wysong and Miles Company
Greensboro, N. C.



PUZZLED?

OVER TAP PERFORMANCE

YOU GET ONLY

½ A TAP
WITH SINGLE TEMPERING

¾ A TAP
WITH DOUBLE TEMPERING
(industry standard)

YOU GET **FULL VALUE TAPS** ⚜
WITH **SOSSNER** TRIPLE TEMPERING

⚜ The mark of Triple Tempering

Triple Tempering—a standard with Sossner—delivers a tougher, more reliable, longer lasting tap...less chipping...less breakage.

OTHER SOSSNER EXCLUSIVES
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  The most complete line

For FULL VALUE TAPS insist on SOSSNER.

SOSSNER TAP & TOOL CORPORATION
29 BROADWAY, LYNBROOK, L.I., N.Y.
FACTORY WAREHOUSES IN NEW YORK AND LOS ANGELES • DEALER STOCKS IN OTHER CITIES

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly pig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work? Put your small work on the LINLEY where it belongs and reserve your large machines for large work, *where large work belongs.* You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

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664 STATE ST. EXT., BRIDGEPORT 1, CONN.

Answers to hundreds of METALWORKING questions—complete in one EASY-TO-USE volume

What leading magazines say about this book:

Automatic Machining: "Offers quick answers to metalworking problems of a practical nature"

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JUST think of being able to find the answer—the dependable answer—to almost any question—quickly—layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances—any detail of machine shop or drafting room practice. The New American Machinist's Handbook presents this kind of information, in the form in which you can best understand and use it.

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"BUY-WORD" for TOOLS for 75 years...the WILLIAMS DISTRIBUTOR

In Early Industrial America

An adjustable wrench, such as this 125 year old relic, was a great advance in the tools of the times. This one was picked up in the Onondaga Valley about 1870 by Horace Erdreich (a peddler).

Supplying customers with tools of the trade from his wagon or trading store, the pioneer distributor established a service essential to the growth of many industries.

Today, Distribution Keys Production

Williams Superrenches® are typical of the functionally designed, precision-made tools in the "Broadest Line of Its Kind". To make these tools available promptly, economically and conveniently, Williams continues to work hand-in-hand

with the Industrial Distributor... adding to quality products all extra advantages provided by the Distributor.

Offering prompt, personal service, local Williams Distributors save valuable time and money in ordering, production and inventory. Perhaps even more important is a service rendered which can not be bought... IDEAS. Sound, practical ideas based upon a variety of outside experiences... unbiased and beneficial.

- **Reason enough, (and there are plenty more) why your best buy in tools is always through your Williams Distributor.**

J.H. WILLIAMS & CO. BUFFALO N.Y. 1852 75th Anniversary 1957 WILLIAMS TOOLS OF INDUSTRY

WILLIAMS

407 VULCAN STREET
BUFFALO, NEW YORK

BUFFALO • NEW YORK • CHICAGO • LOS ANGELES

Look what this new DoALL Band Mill Can Do:

DoALL BAND MILLING MACHINE
Model 26-5

18" work height standard
26" throat depth
2" Demon HSS Blade
40" Stroke—2 ton cap. table
Var. speeds 55 to 10,000 FPM
cuts to 10 sq. in. per min.

55 MINUTES CUTTING TIME
at a rate of 10 square inches per minute!

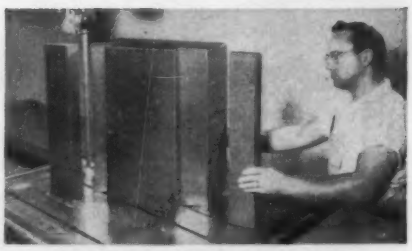
LOOK AT THE ACCURACY
A straightedge shows the accuracy on the cut illustrated at right—parallel and true within .002".

new accuracy and speed, new economy for straight cuts on heavy work pieces!

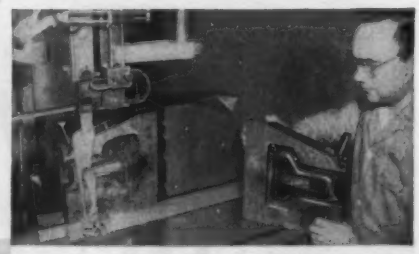
HERE'S the machine for making straight cuts through increasingly heavier, tougher and more difficult to part materials. The new DoALL Model 26-5 heavy duty Band Mill brings band machine efficiency to jobs you may now be doing on milling machines, shapers or planers. It will rip heavy plate, shank or reface forging die blocks, trim heavy castings or slab massive billets in a fraction of the time . . . *at a fraction of the cost* involved with much more costly machine tools.

A new 2" wide HSS Demon Saw Band provides beam strength to take heavy feed pressures delivered by a new hydraulic powered 40" stroke screw feed table mounted on hand scraped lubricated ways. The saw band is rigidly tensioned on *grip tight* band wheels to insure fast, smooth and accurate cuts—without surge or slippage. The two ton capacity table provides vernier controlled positive feeds down to .100" per minute to give you new ease and accuracy in handling the biggest work pieces.

Call your DoALL Sales-Service Store for more information on this dramatic machine tool bargain today or write for literature: **The DoALL Company, Des Plaines, Illinois.**



SHANK FORGING DIES!
Remove complete *usable* sections of costly materials instead of reducing it to chip waste. You save time and material.

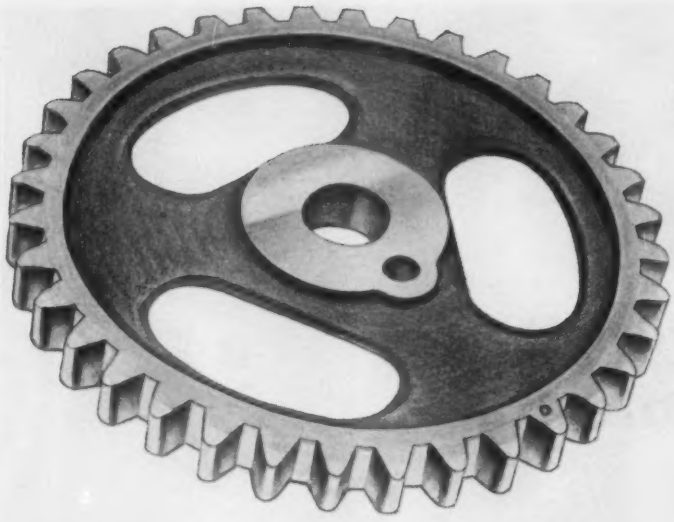


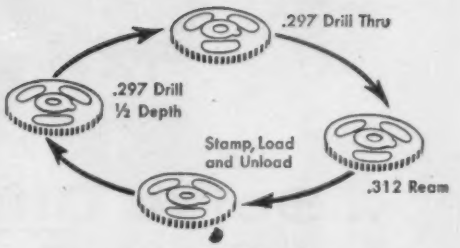
REFACE DIE BLOCKS
Reduce rough machining time and cost. Save slower, more costly machines for finishing work.

DoALL

For Lowest Cost . . . do it on a DoALL!

B-38



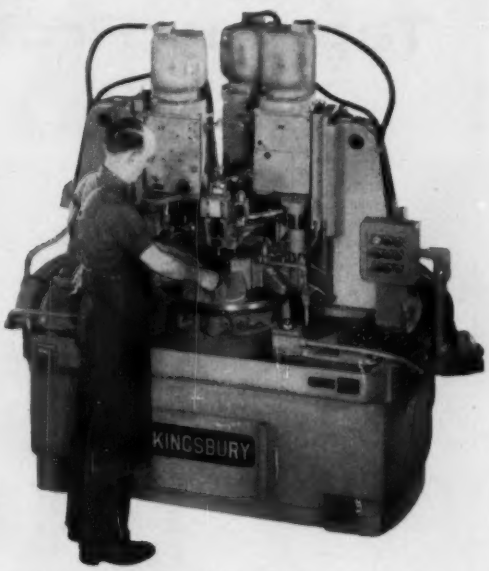


450 PER HOUR GROSS

- **DRILLED**
- **REAMED**
- **STAMPED**

— on this high production

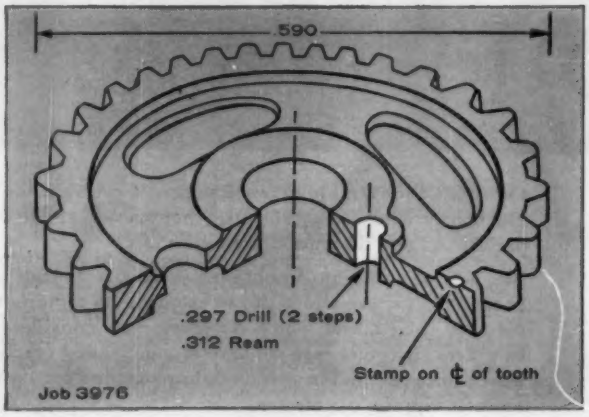
KINGSBURY



This 4-station Kingsbury has a 72" semi-circular base, 20" index table, JIC electrical controls (not shown)

This machine has three single-spindle vertical units, two for drilling and the third for reaming. Drilling in two steps shortens the time cycle, thereby increasing the hourly production. A special mechanism at the operator's station stamps the gear. The operator has only to load the work, push a button, unload completed work. All operations are done automatically at each station.

Kingsbury indexing automatics are built for jobs as simple as this one, to complex ones involving a dozen or more drilling, tapping and other operations. In every case, the customer gets a fully tooled machine, ready to produce at the rates he wants. If you have operations like these, we'd like to show you how economically they can be done on a Kingsbury. Kingsbury Machine Tool Corporation, Keene, N. H.



KINGSBURY

INDEXING AUTOMATICS

for high production drilling and tapping

Wood & Spencer

TAPS

...Solve Difficult Tapping Problems

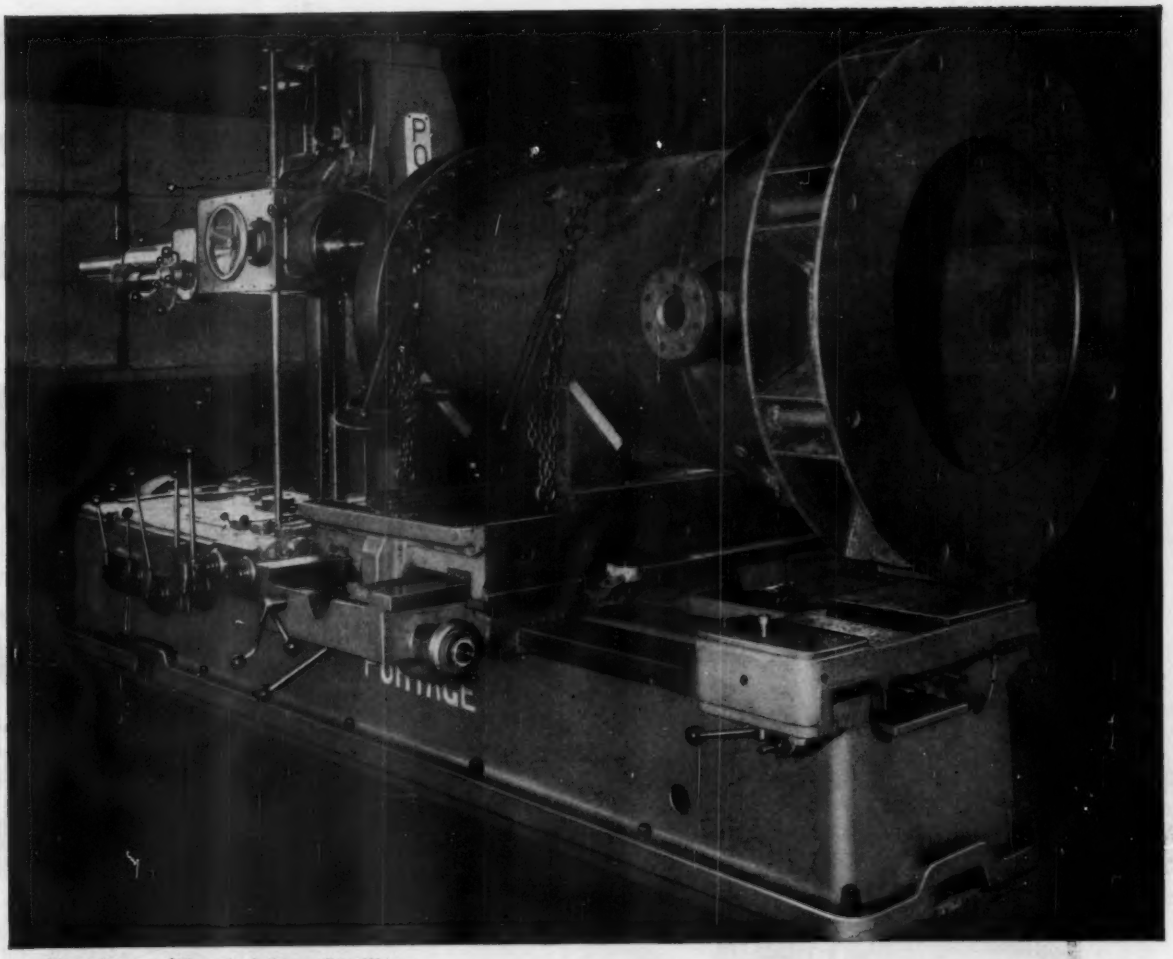
On routine jobs, tapping isn't much of a problem today. No matter whose taps you use, they are all about equally precise . . . and do a good threading job.

But, you may run into trouble on especially difficult tapping jobs. In fact, the picture above shows examples of tapping troubles we have solved, and which our customers considered difficult. In practically every case we have recommended practices which have resulted in substantial savings for our customers on their tapping operations.

We have many other examples on file, and we'll be glad to help you solve *your* problem if you'll call us.

Want a free tap guide: Everyone who has one finds this handy wall chart an excellent ready-reference. It tells all standard gage tolerances, class fits and tap tolerances. Write us for one on your business letterhead.

The Wood & Spencer Company • Cleveland 3, Ohio



Photograph courtesy of Western Supply Company, Tulsa, Oklahoma

Read what this man has to say about PORTAGE MILLS!

Mr. D. W. Brady, Plant Manager of Western Supply Company, Tulsa, Oklahoma says,

"Our manufacturing facilities here at Western are devoted almost entirely to heat exchanger production. We have found the versatility of the Portage Mills allows us to do a wide variety of machining operations required in the fabrication of this type of work. We have found the machine to be very reliable and have experienced no lost time for repairs since it was installed."

Mr. Brady's kind remarks are typical of those coming in from across the country ... PORTAGE MILLS are truly the *machine of the year* ... and remember ... Portage costs less to buy. Write for the illustrated catalog ... and ask for a proposal too!

THE Portage MACHINE CO.

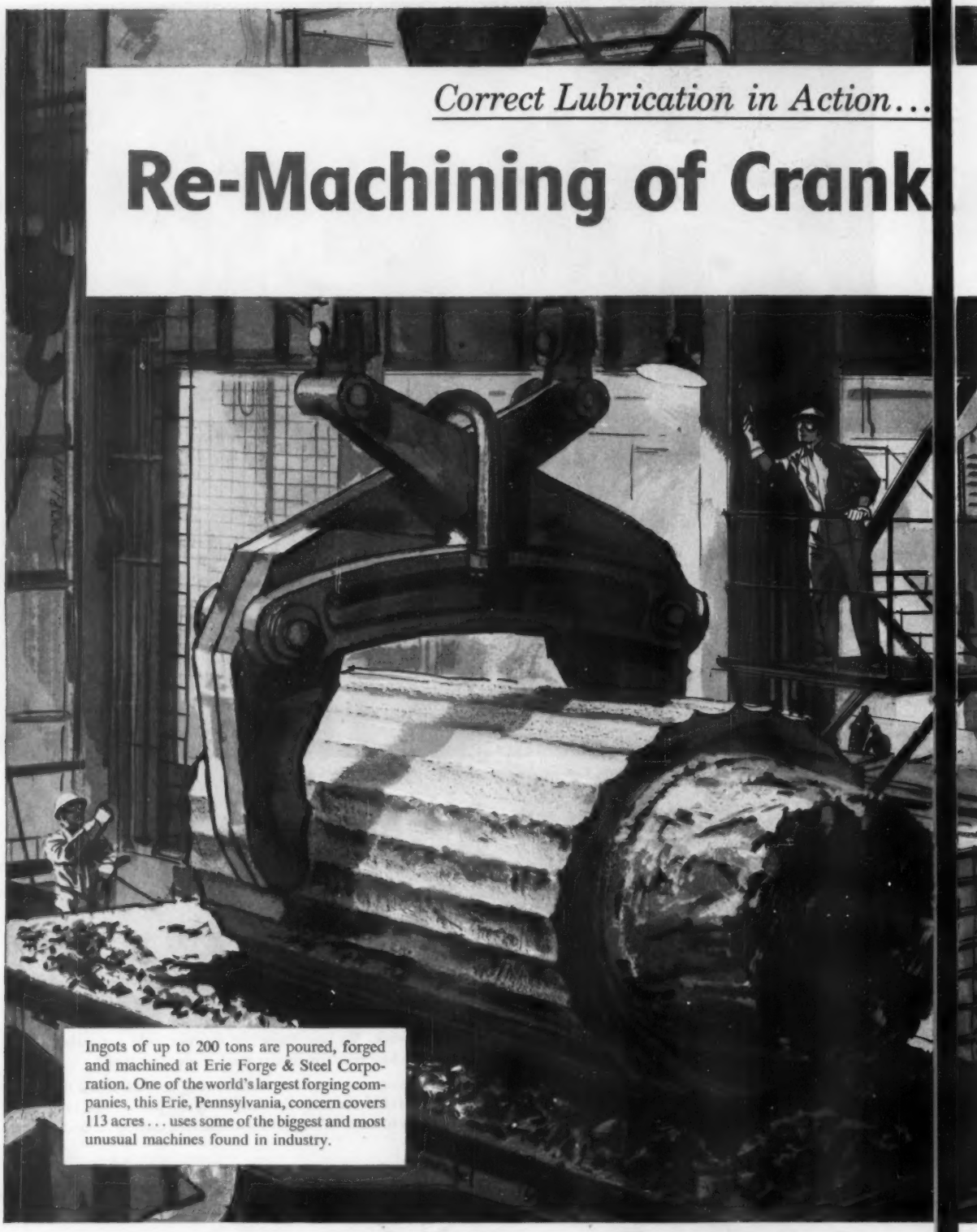
1026 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

Correct Lubrication in Action...

Re-Machining of Crank



Ingots of up to 200 tons are poured, forged and machined at Erie Forge & Steel Corporation. One of the world's largest forging companies, this Erie, Pennsylvania, concern covers 113 acres . . . uses some of the biggest and most unusual machines found in industry.

Mobil

SOCONY MOBIL

Leader in Lubrication for over 91 years

in the **Forging Industry**

shaft Pins Eliminated

–$30,000 SAVED!

One of many ways Erie Forge & Steel Corporation has cut production costs over $100,000 through the help of Socony Mobil

At Erie Forge & Steel Corporation, where the world's largest crankshafts are produced, equipment and methods are constantly scrutinized for ways to increase production and reduce maintenance costs. Plant records show how Socony Mobil has helped.

For example: During machining of Diesel crankshaft pins, metal particles welded to cutting tool tip. This excessive build-up resulted in rough finish of pin surfaces. This necessitated re-machining of up to 18 crankshaft pins a day.

A Mobil lubrication engineer analyzed the operation . . . recommended a special Mobil cutting oil. Rough finish trouble disappeared, resulting in savings of $30,000 in one year. *This one saving alone more than paid for the plant's annual cost of lubricants.*

This is Correct Lubrication in Action—the *only* program that combines 91 years of lubrication knowledge with the most experienced lubrication engineers and quality products. Why not find out how it can cut your operating costs?

This complete cost-cutting service can be yours!

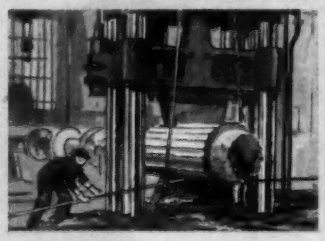
After a Mobil representative thoroughly analyzes your plant's lubrication needs, a program of Correct Lubrication is put into action. Here are some of the ways this program benefited the Erie Forge & Steel Corporation.

World's Greatest Lubrication Knowledge—Since 1866, Socony Mobil has worked with every type of industry, on every kind of machine operation. **This vast experience enabled Mobil to suggest a cleaning method to Erie Forge that eliminated monthly dismantling of hydraulic and circulating systems . . . saved $49,719 in four years.**

Continuous research and product development—Socony Mobil products are continually improved . . . new products developed to meet industry's latest needs. **A new Mobil extreme-pressure gear lubricant was recommended for Alliance 75-ton cranes. It cut wear under overload conditions . . . prolonged gear life . . . saved $1,500 in labor and material cost.**

Periodic product analyses—This service provides a thorough check on lubricant and machine performance . . . can detect trouble before it reaches the serious stage. **Analyses of samples taken from central coolant system at Erie Forge indicated bacterial contamination. Steps were taken to arrest condition, thus avoiding shutdown of all boring and sawing operations.**

Experienced engineers—Mobil engineers work closely with plant personnel . . . can call on years of practical experience to cut plant production costs. **At Erie Forge & Steel Corporation rams on hydraulic presses had to be repacked every two weeks due to high-temperature operation. Recommendation by Mobil engineer greatly extended packing life . . . cut labor costs . . . saved $20,000 in four months.**



Correct Lubrication

A proved program to reduce maintenance costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

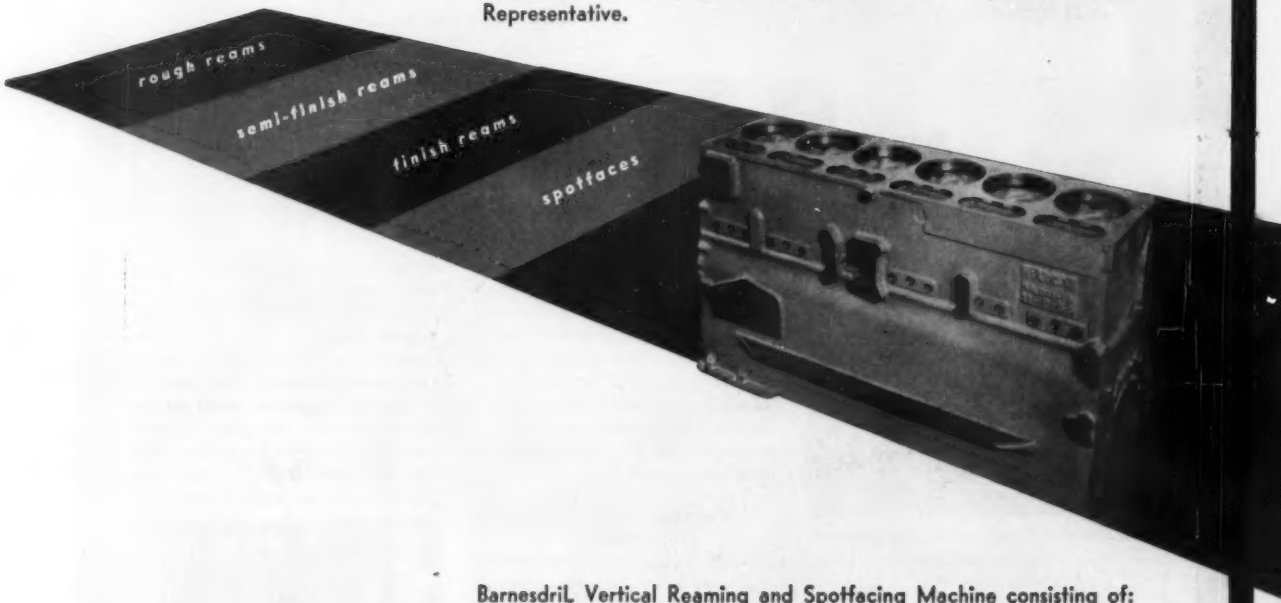
BARNESDRIL
combines 72 operations

This BarnesdriL Vertical Reaming and Spotfacing Machine rough reams, semi-finish reams, finish reams and spotfaces diesel engine blocks. It combines a total of 72 machining operations into a single machining cycle with six positions.

At the first position, 12 valve guide bores are rough reamed and 18 pads are spotfaced. The second position rough reams 6 injector bores. Third and fourth positions semi-finish ream the 12 valve guide bores and the 6 injection bores. At the final two positions both the valve guide and injector bores are finished reamed.

Previously, the machining of these blocks was performed by a Slip-Spindle-Type Machine with a two position fixture. The 12 valve bores were machined in one position and the 6 injector bores in the other. Alternate passes were made for rough, semi-finish and finish reaming with tool changes being made after each pass. Spotfacing was performed on another machine.

Combining operations into a single machine to cut labor costs and to meet required production rates, is the business of BarnesdriL. If you have a hole finishing production problem, contact your BarnesdriL Representative.



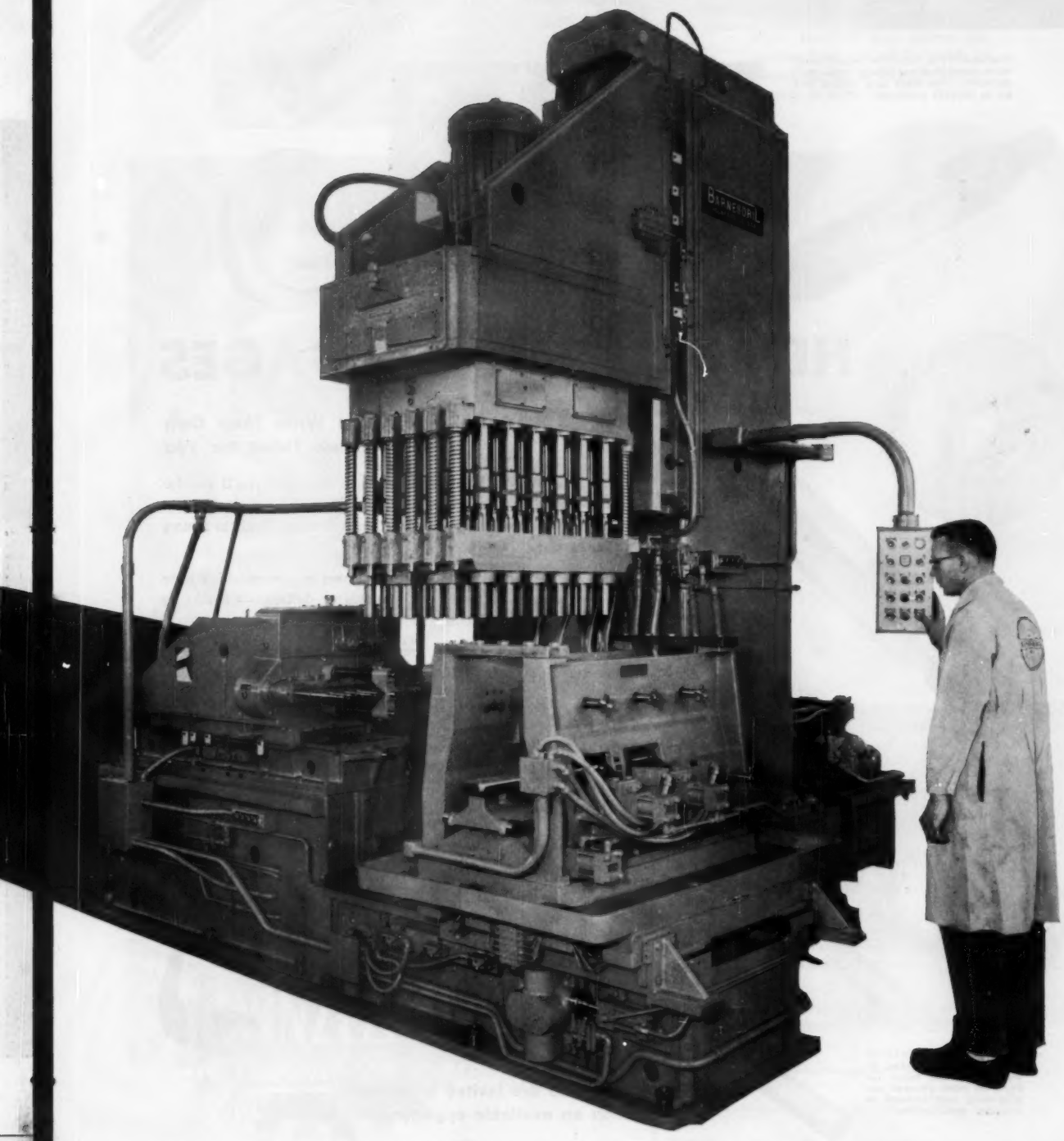
BarnesdriL Vertical Reaming and Spotfacing Machine consisting of: A Saddle Type Unit arranged for rapid approach, feed and rapid return on vertical column with a 54-spindle reaming head; a Saddle Type Unit arranged for rapid approach, feed and rapid return on a horizontal base section with an 18-spindle auxiliary head; a 6-position 10" index automatic hydraulic lateral index table; an automatic lubricating system and fixture.

50th year

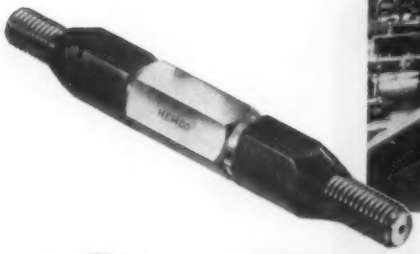
BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

into a single machining cycle



Produced in a modern plant under ideal controlled conditions, with quick deliveries from stock as a special service to HEMCO customers.



HEMCO-PROCESS GAGES

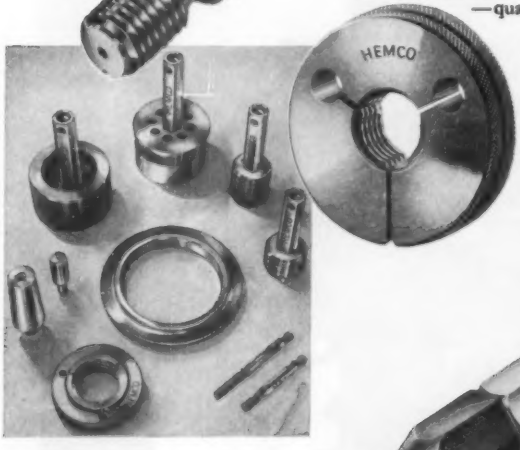
Try Them — Let Them Write Their Own Performance Ticket For You

MUCH LONGER WEAR LIFE — so much more life you'll wonder how it can be possible. Put HEMCO-PROCESS GAGES to the test in your own applications, and this extra wear life will reveal itself in a most convincing demonstration.

MUCH LOWER COST — so much less money to invest in your working gage needs, you'll count your savings in terms of thousands of dollars, — thanks to HEMCO-PROCESS GAGES low initial cost and their wear life.

MUCH HIGHER GAGE QUALITY—a precision quality you can see and feel, —quality that stamps HEMCO-PROCESS GAGES the ultimate in their field.

THE ANSWER TO ALL THIS is found in the exclusive HEMCO PROCESS, — the only process that imparts a super hard Chrome surface unqualifiedly guaranteed not to chip or peel, no matter what type of gage. Case histories, covering all kinds of industrial and U. S. Procurement customer situations, prove the superior merit of HEMCO-PROCESS GAGES.



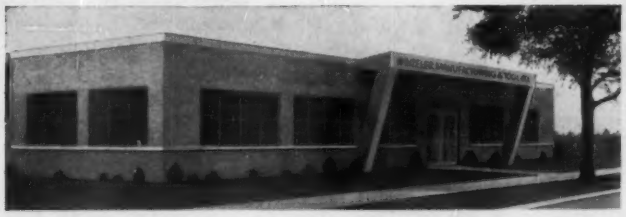
All types and sizes of standard working gages, as well as special types for even the most unusual applications, engineered to customer specification.

Inquire about the COMPAROSCOPE — the versatile optical instrument for evaluating surface finishes.

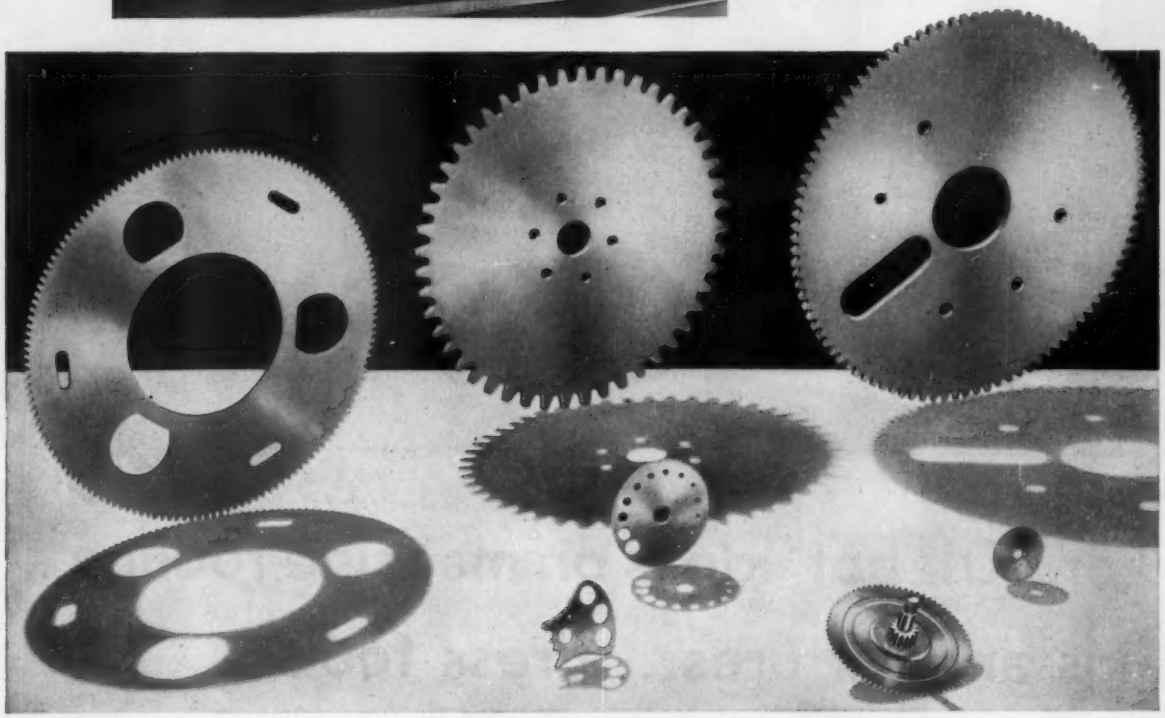
DISTRIBUTORS are invited to request information on available opportunities.

H. E. MORSE CO. • HOLLAND, MICH. • (TWX – Holland, Mich., #567)

The Outstanding Success of Winzeler STAMPED Gearing Results from Vastly Improved Methods of Tooling, Stamping and Inspection



Winzeler accuracy and efficiency is now greater than ever in this brand new, specially designed, one-floor plant. Here, highly developed men, methods and machines keep pace with the rapidly increasing demand for the better Stamped Gearing we make.



WINZELER is now better equipped than ever to *Stamp* Gearing in production runs. Greatly enlarged, modernized plant, methods and equipment produce Gearing by the thousands or *millions* with a degree of speed and uniform accuracy generally considered impossible! Skilled WINZELER engineers can lend you valuable aid in determining the ONE best and most economical application for your specific needs.

WINZELER now *stamps* better Gearing from *8 to 120* dp . . from .006 to 3/16" thickness and up to 7 inch diameter. Single stampings are often laminated and indexed to produce wider faces at savings up to 60%! Now, BAKELITE Gearing is successfully stamped and shaved, with special tooling, from material up to 1/8" thick. Teeth are sharp, clean-cut, uniformly accurate. Join the fast-growing group of critical customers who improve quality, performance and profits by using WINZELER *Stamped* Gearing exclusively. Write us now about *your* needs.

WINZELER *Stamped Gears*

MAIL THE COUPON FOR FREE STAMPED GEAR FOLDER

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Gentlemen:

Please mail to me, at once, a copy of the free WINZELER Stamped Gear folder.

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For 201 "hot" ideas on machine tooling... jigs and fixtures... press tools...

See Section C—Tooling—in your AM Annual Production Planbook and Buyers' Guide Issue

New York—If you're stymied for **tooling** ideas to do the job "right" there's plenty of help handy in your American Machinist Production Planbook and Buyers' Guide Issue. Section C is crammed with over 200 tooling facts and information items —lathe tooling, carbide and ceramic tools, grinding wheels, plastic dies and tooling, press tools, and welding, brazing and heat-treating fixtures. They are tooling "Nuggets," core ideas extracted from articles published in regular issues of American Machinist. Issue dates and page numbers are shown if you wish to refer to the full text. Many of the original photos, sketches and diagrams are republished in the "Nuggets" section of your Planbook.

Did you know . . .?

For a checklist of modern ideas on tooling, see pages C-12 and C-13, "Tooling Developments to Watch," a highly useful, idea-sparking feature of your Production Planbook. Then, starting on page C-24, is a list of Free Literature offered by tooling manufacturers to enable you to get product information quickly and easily.

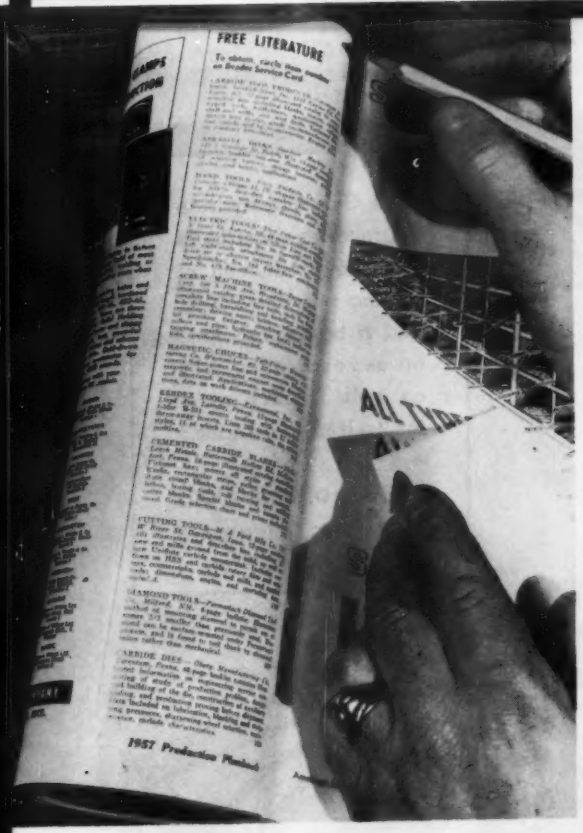
Section J, a complete classified Buyers' Guide, lists sources of supply for all the machine tools, tooling, other production equipment, materials, parts and components, and supplies—everything you need to put your ideas to work.

Vendors names shown in bold face type are advertisers in the issue, and page numbers of their advertisements are provided to make easier your job of getting product information.

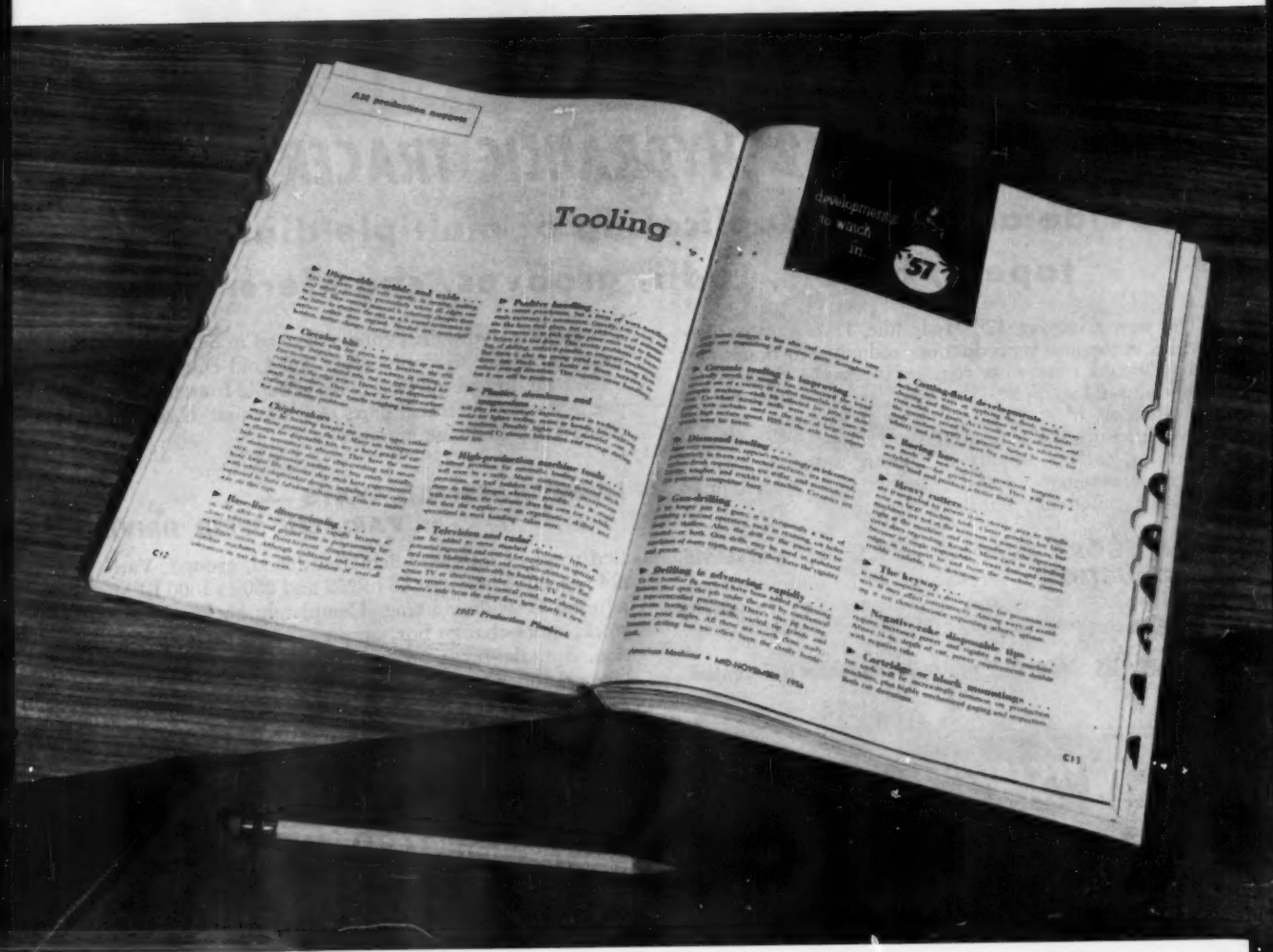
Coming Mid-September, 1957

Your 1958 edition of American Machinist's Production Planbook and Buyers' Guide Issue is now in preparation for publication in Mid-September, 1957.

It will again provide you with an easy-to-use, thumb-indexed reference showing "How-to-do-it," "What-to-do-it-with," and "Where-to-buy-it" in a single, manageable, year 'round issue.


FREE LITERATURE
1957 Production Planbook

1957 BUYERS' GUIDE
FOR METALWORKING


All production reports
Tooling . . .
development to watch in '57
Positive handling
Plastics, aluminum and magnesium
High-production machine tools
Television and radio
Ceramic tooling is improving
Diamond tooling
Gun-drilling
Drilling is advancing rapidly
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Negative-rake disposable tips
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"FORGING PUNCH PRODUCTION INCREASED 600%"

"Our Clausing hydraulic tracer enabled us to increase production of forging punches 600%, and it has saved time on several other jobs as well. It sure paid for itself in short order."

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NEW CLAUSING 12" HYDRAULIC TRACER LATHES

provide automatic duplicating of multiple diameters, tapers, bevels, radii, grooves, chamfers.

The new Clausing 12" Hydraulic Tracer Lathe provides automatic reproduction, reducing to hours jobs that would otherwise require weeks or days. With this new CLAUSING you can . . . do automatic reproduction of intricate patterns · eliminate repetitive measurements, multiple tool set-ups, expensive forming tools · impart a smooth, stepless finish · provide automatic sizing · reduce chance for human error · practically eliminate scrap.

FOR SHORT RUN AS WELL AS VOLUME PRODUCTION — short runs can be done economically because set-up and tool changes can be made in minutes. Savings on long runs are phenomenal.

HANDLES WORK up to 2¼" diameter differential, 18" length. Hydraulic cylinder housed in Servo motor provides power to firmly drive and hold cutting tool. Slide feed, in and out, infinitely variable from 0 to 15" per minute. All critical parts of tracer unit hardened, ground and machine lapped.

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Bed ways of lathe are flame hardened, ground. Variable speed drive from 43 to 222 and 250 to 1300 RPM, adjustable while running. Completely enclosed head stock, quick-change box, apron . . . oil bath lubrication. Spindle turns on big Timken "Zero-Precision" tapered roller bearings.

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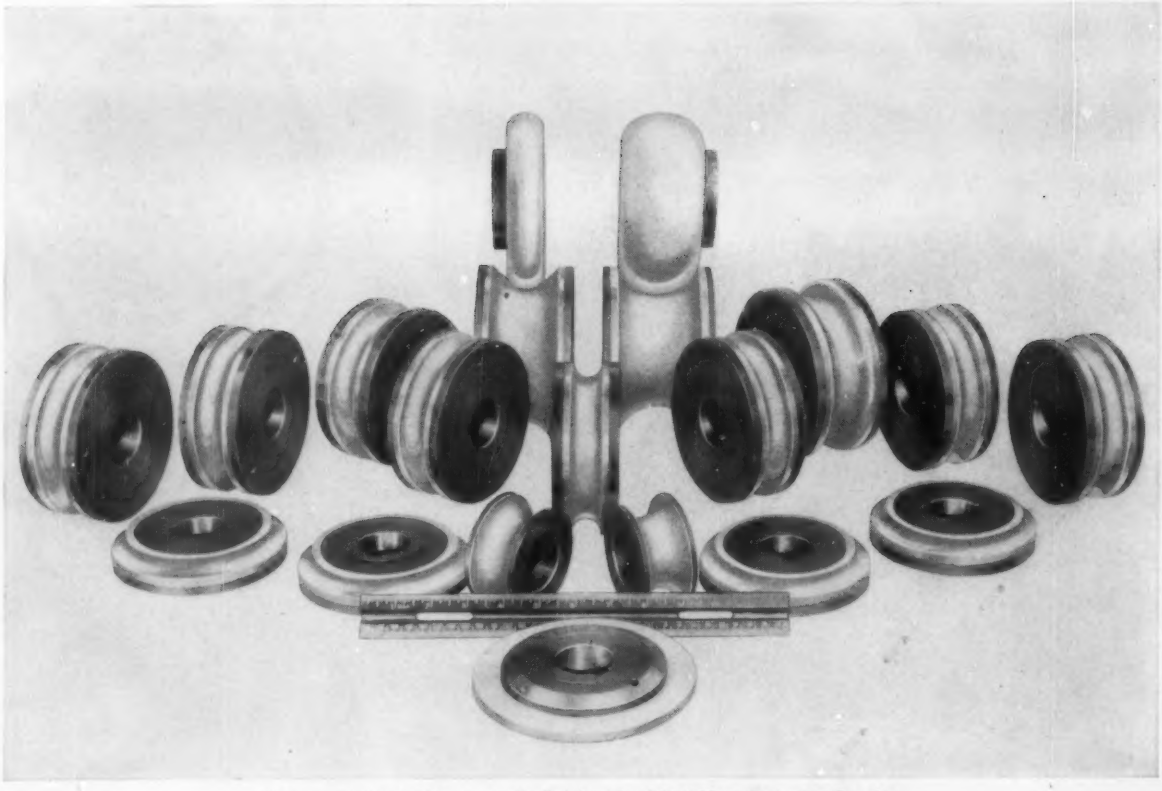
Made by THREADWELL, Greenfield, Mass.



Kennametal tube-forming rolls finished by Allied Manufacturing Co., Inc.

Tube-forming rolls of KENNAMETAL* save 20 times their initial cost

- **outwear steel rolls 10 to 1**
- **improved product appearance**
- **greatly increased production**
- **less tube mill downtime**

One male roll of Kennametal was run for 345 days for the final form on a tube-forming mill. Upon removal for inspection, after producing 20,700,000 feet of tubing, the Kennametal roll was found to be in perfect condition. During that time, steel rolls in the mill were replaced every 6 to 8 weeks, with 2 to 4 days lost in downtime to replace rolls and line up the machine . . . or a loss of 60,000 feet in production per day of downtime.

The results of this test were so outstanding that all of the steel rolls on this operation were replaced by rolls of Kennametal which have been in continuous operation for over six months. With a life expectancy of at least ten to one over steel rolls, the Kennametal rolls are expected to pay for themselves within four months, with a total saving on the investment of over $450,000.

Other benefits: (1) the harder surface of Kennametal gives a higher finish and improved product appearance, (2) increased machine speed, permissible with Kennametal, makes greater production possible.

Choose Kennametal for your tube-forming operations

Kennametal's "90 Series" with six grades and the exclusive non-galling "80 Series" with three grades provide a range of grades to meet the specific requirement of practically any tube-forming die or wear part application. Kennametal sustains high production rates, maintains accuracy over extremely long production runs with a minimum of maintenance and machine downtime—all contributing to lower unit costs.

Choose Kennametal for your next die parts . . . for blanking, stamping, compacting, perforating, slitting, piercing, cold heading, swaging, forming, cupping, drawing. Kennametal die engineers will gladly work with you and your die maker in applying the right grade to meet your requirements. Call your nearest Kennametal office or write KENNAMETAL INC., Latrobe, Pennsylvania.

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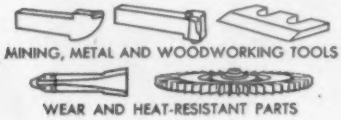
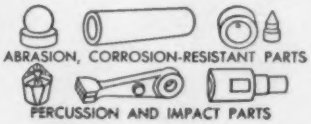
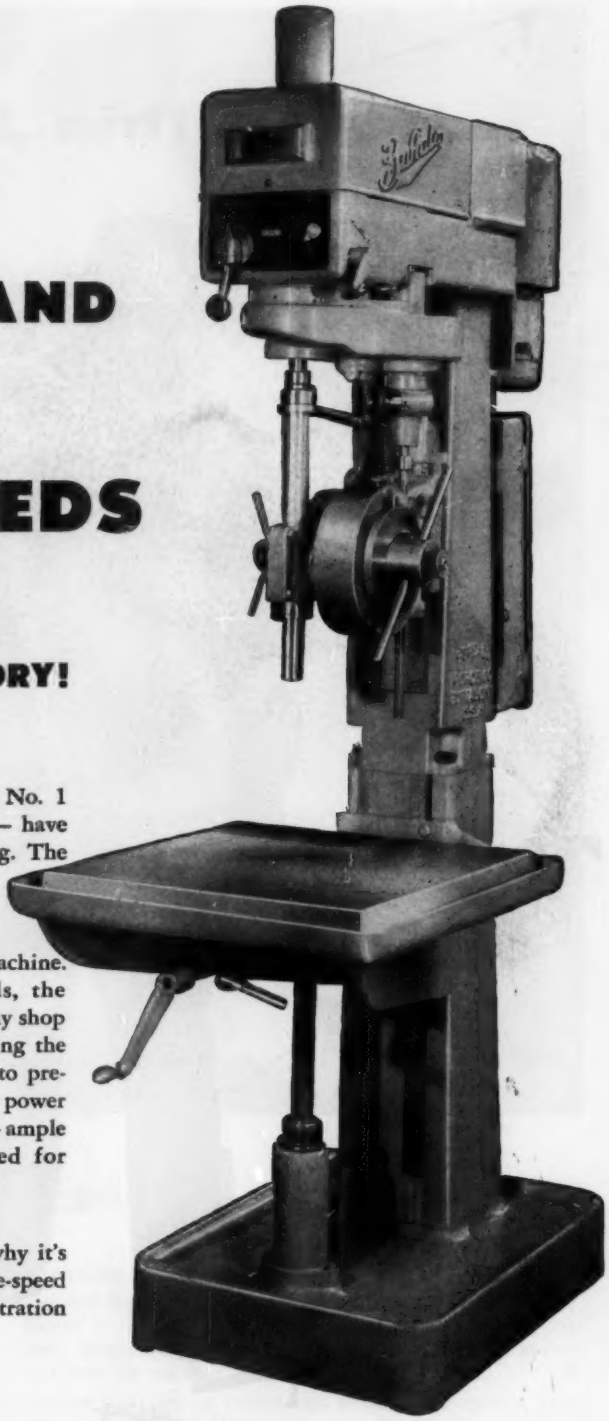


INDUSTRY AND KENNAMETAL ...Partners in Progress



IN THE OPERATOR'S HAND —1001 DRILLING SPEEDS

— PLUS THE SMOOTHEST OPERATION IN DRILL HISTORY!



The gearless variable speed drive in the new No. 1 "RPMster" — plus "Buffalo" craftsmanship — have brought a new smoothness and ease to drilling. The shift handle at left places the drive in high or low range, while the dial at right provides infinite variations in either range. They're easily reached, as are all controls on this 88"-high machine. Made in one-to-six spindle pedestal models, the "RPMster" has long-life and accuracy features any shop man will appreciate — all moving parts including the precision spindle machined *after* heat treating to prevent warpage — hand scraped ways — "Buffalo" power feed — strong, rigid, stable base and frame — ample work tables — all parts carefully hand-fitted for permanent accuracy.

But you have to operate an "RPMster" to see why it's literally the finest value in vibration-free, variable-speed drilling available. Write for details on a demonstration at your "Buffalo" machine tool dealer's.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING

how's this for performance?

15 lbs. of scrap after cutting 156 parts from a 6′ x 10′ plate of ⅜″ steel

Using four torches guided by an electronic tracer, an Airco #48 Duograph automatically flame cut 156 parts from a ⅜″ x 72″ x 120″ steel plate. Of the original 918 pounds of sheet steel, only 15 pounds of scrap remained. Discover the advantages to be gained by using Airco flame-cutting machines for fast, economical production. In addition to the #48 Duograph, Airco flame-cutting machines include the Airco Travograph, Oxygraph, Duograph, Monograph, Camograph, and Radiagraph. Write Airco for complete information and literature.

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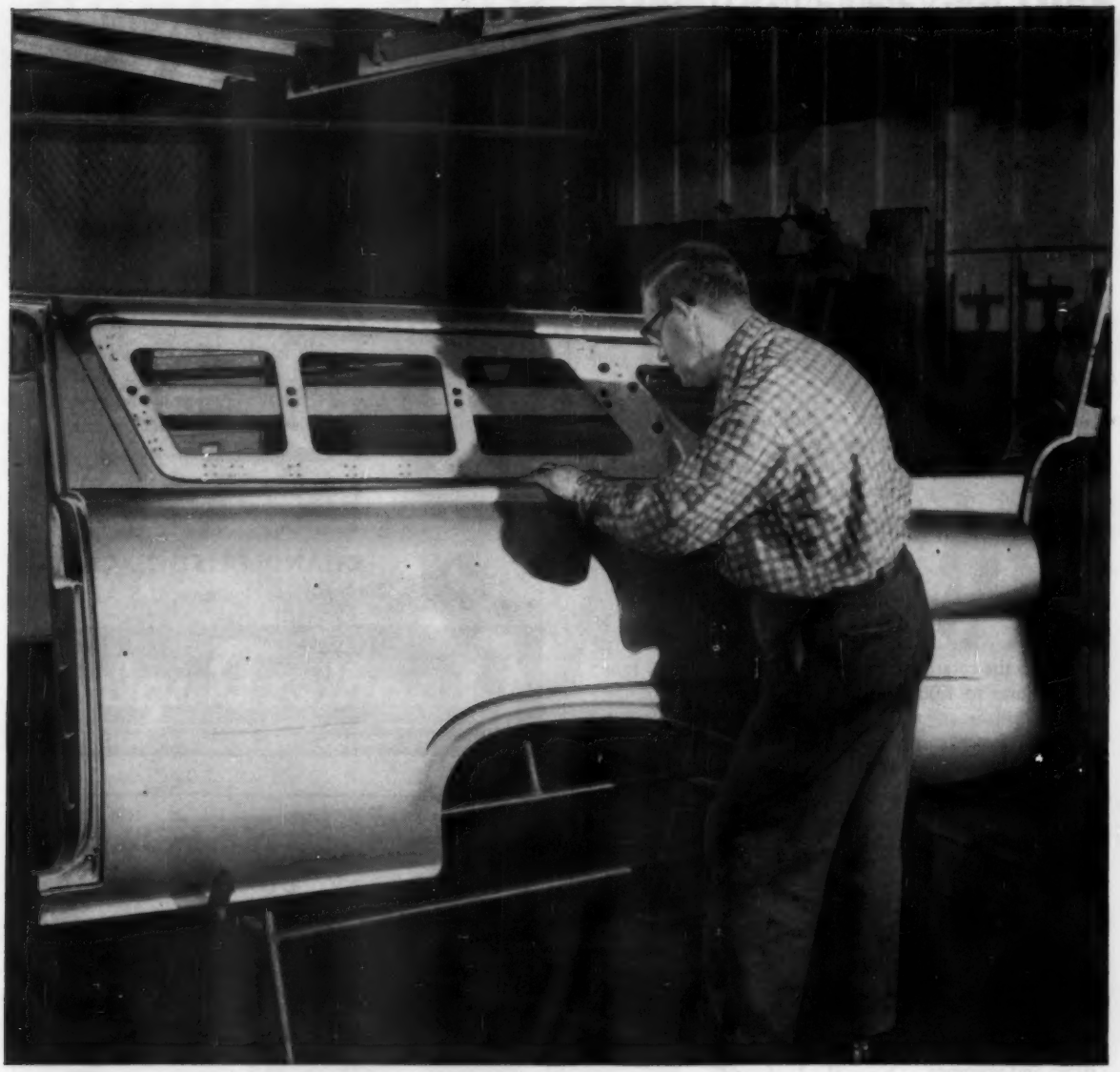
Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide — gaseous, liquid, solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl acetate, alcohols, and other synthetic resins.



Lightweight magnesium fixture checks Ford station wagons

This magnesium checking fixture is used by Ford Motor Company in assembling Ford two-door station wagons.

It helps to maintain quality by checking the daylight opening relationship to the glass run channel and regulator retainer brackets in the quarter panel welded assembly. It assures accurate location of the glass run retainers and window regulator mounting holes. The fixture is dimensionally stable and has stood up well under continuous rough handling. One man can easily lift and manipulate it with one hand.

Jigs and fixtures made with magnesium are always easy to handle because they weigh much less than steel or aluminum. Magnesium tooling plate is uniformly flat, low in cost and easy to machine, fabricate and weld.

For the full story on magnesium tooling plate contact your nearest supplier of Dow magnesium or write to us.

THE DOW CHEMICAL COMPANY, Midland, Michigan, Department MA 1416X.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill. Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Co., Los Angeles, Calif. Vinson Steel and Aluminum Co., Dallas, Texas.

YOU CAN DEPEND ON DOW

DRILL PRECISION HOLES IN ONE PASS

Gun Drilling Does It

WITH SEALOL'S
DRILL ADAPTOR
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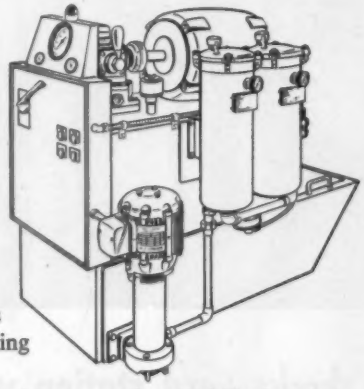
COOLANT SUPPLY UNIT

Deep or shallow precision holes in one pass . . . without those profit-cutting steps of boring, reaming or honing.

SEALOL DRILL ADAPTOR — converts your regular, solid-spindle drilling equipment for precision gun drilling of all types.

Transfers coolant from a stationary source to the rotating gun drill at speeds to 10,000 rpm — pressures to 1,000 psi. Coolant is delivered through the gun drill directly to the cutting edge. Work runs cooler; drills cut faster, more accurately and with less power.

SEALOL HI-PRESSURE COOLANT SUPPLY UNIT — provides a high volume of micro-clean coolant at proper pressures and volumes for precision drilling of *all* types.



Filters, cools and pumps coolant to drill adaptor at pressures to 1,000 psi — volume to 40 gpm (higher capacities available) for modern gun or oil-hole drilling.

MAIL THIS COUPON TODAY!

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Please send me Bulletin information on Sealol gun drilling equipment.

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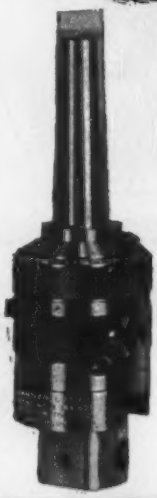
CITY _____ ZONE _____ STATE _____

IT'S PLAIN TO see



A Boring Head That Won't Face is NOT Complete

NOW you can get a boring head that will BORE, FACE, TURN and GROOVE at no more cost than you would pay for a plain, single purpose boring head.

LOOK INTO THIS before you buy that new head. Write for full details.

CHANDLER TOOL CO.
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COMBINED BORING AND FACING TOOLHEADS

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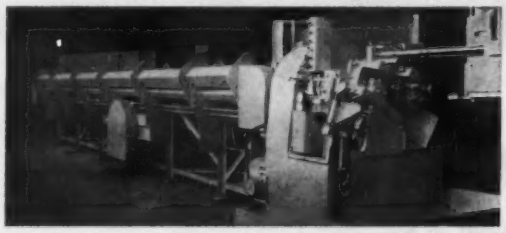
Willy, using grandpa's razor,
Found it much too sharp and keen.
He should get a modern type—
A safety cutting-off machine.



Old methods of cutting-off tubing and bar stock, with tubing diameters up to 8 inches, have been made obsolete by the Modern Automatic Cutting-off Machine and Automatic Stock Feeder.

We have prepared a booklet describing this speedy, accurate, automatic machine. It contains valuable information for any organization interested in faster, cheaper cutting-off operations.

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NOW! Use ONLY ONE Setting Master to set Dial Bore Gages . . .

STANDARD ELIMINATES COSTLY RING MASTERS AND PLATE SET-UPS...

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STABILIZE ALLOY STEEL by complete change of austenite to martensite.

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Complete range of model sizes. Custom built to your specifications.

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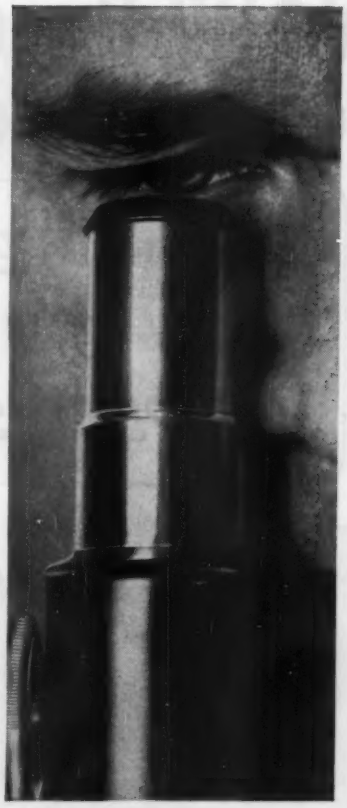

This man is looking into your future

How does it look? Rosy? Free of cancer? You hope! But hoping isn't enough. Of every 6 Americans who get cancer this year, 3 will die because science still has no cure. It will take research . . . *lots* of research . . . to find that cure. And research, let's face it, takes money.

Instead of just standing by with hope, pitch in and help. Send your dollars . . . whatever you can afford . . . to the American Cancer Society today. You'll be bringing yourself and everyone else that much closer to a sure future. Send your check to "Cancer" in care of your local Post Office.

American Cancer Society

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Sigma welding is an extremely versatile process—it joins metal alloys ranging in thickness from 0.035 inch to more than five inches (in multipass operations)—and attains up to four times faster wire deposition than other welding processes.

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IMPERIAL *Hi-Duty*

Tube fittings

36 to 77% savings in installation time!

Just push tube into fitting without removing nut and tighten...that's all

Tests reveal Hi-Duty fittings make tube connections in *36%* less time than regular compression fittings . . . *77%* less time than flare fittings. Unit has one-piece nut and sleeve. The sleeve shears off in assembly. You get stronger joints because sleeve is always in perfect alignment.

Takes up to 5 times more vibration than ordinary compression or flared fittings. Fittings remain leakproof, even under severe service. Exclusive design minimizes deformation of tubing.

Furnished in brass or aluminum, for ⅛ to 1" O.D. tubing.

Ask for Bulletin No. 3002

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Perfect fluid control! Best protection against leakage. Positive shut-off. 2, 3 and 4-way types. Low and medium pressures.

THE IMPERIAL BRASS MFG. CO. • 573 South Racine Ave., Chicago 7, Ill.

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IMPERIAL Industry's Most Complete Line of Tube Fittings and Tubing Tools

VAILL

TUBE END-FORMING MACHINES

shape and form tube ends fast...accurate...at less cost

FREE—New Bulletin T-1 shows, describes VAILL tube end forming machine VERSATILITY for . . .

Beading • Flaring • Flanging • Sinking
Expanding • Grooving • Threading • Reducing
Double Lap Flaring • Double Lap Flanging

on Tubing up to 6"Diam.

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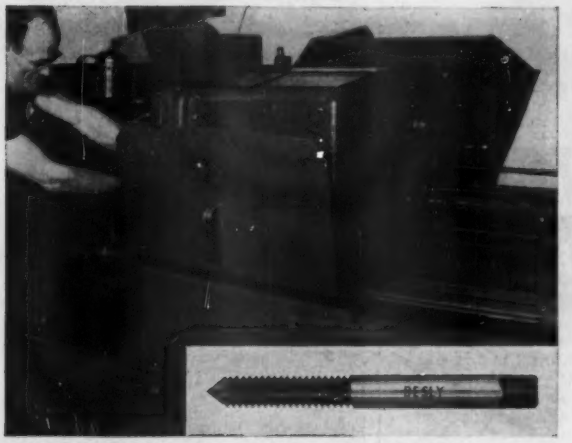
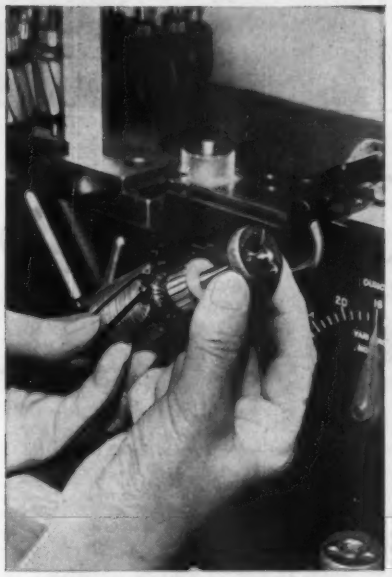
Cutting Tool and Gaging Methods . . . by BESLY



"ROLLING" THREADS IN COPPER—At Steel Industries, Inc., Crawfordsville, Ind., an automatic screw machine is being set up to size, bore and thread 1500 small, difficult-to-tap copper parts per hour. The Besly ¼-28" "X-Press" fluteless tap, shown, is used. H. M. Oshry, Vice-Pres., states, "Besly 'X-Press' Taps made it possible to use this high production method successfully. We get stronger, better, rolled (pressed, not cut) internal threads with no burrs or chips — longer tool life and fewer rejects."

MODIFIED TO FIT — The Gabriel Company, Cleveland, requires two concentric tapped holes in die-cast aluminum pistons used in their airplane type shock absorbers. Originally these were tapped individually — requiring 18 seconds per piece. To reduce this time, a unique set-up using Besly Taps was developed. A smaller Besly Tap is fitted inside the bored-out center of the larger Besly Tap. Two holes are now accurately tapped simultaneously in 9 seconds.



PRECISION ACCURACY—Bodine Electric Co., Chicago, uses Besly-Metro thread plug, thread ring, plain cylindrical plug and ring gages to assure precision accuracy of parts for electrical motor production. Asked why he uses them, A. Wermund, inspection foreman, says, "Last longer — sturdier built."

CARBIDE TOOLS IN ACTION — Cast steel truck wheels made by Gunnite Foundries Corp., Rockford, Illinois, are rough bored with a Besly BL-12-B5 Standard Carbide Tipped Tool, arrow 1, removing ⅛" to ⅜" of stock. On the same turret lathe a second Besly AL-12-B5 Standard Carbide Tipped Tool, arrow 2, semi-finish bores, removing .030" stock. Metal removal is at 200 S.F.M. at .016" feed. Besly's Engineering Service helped to achieve this efficient, low-cost metal removal set-up.

Prove to yourself that Besly Cutting Tools and Gages produce better results. Put them on trial on your toughest jobs, and check the difference in longer tool life, less down time, fewer rejects and faster production. If you'd like to try Besly tools or use Besly's Engineering Service, see your Besly distributor for details, or write us . . .

Engineering, Service and "Specials"... are a Besly Specialty

BESLY

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CORPORATION
Est. as C. H. Besly & Co. 1875
120 Dearborn Ave., South Beloit, Illinois

TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES
CARBIDE TIPPED TOOLS, BLANKS, TOSS-AWAY INSERTS and HOLDERS

Hotpoint
CUTS WEEKS ON
MODEL CHANGE . . .
PRESS DIES
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THE PLASTIC STEEL®
80% STEEL — 20% PLASTIC

Hotpoint wanted to produce panels for their new models . . . without waiting costly weeks for regular dies.
Starting from scratch, it took just 5 days to start press production with DEVCON tooling. Later, tool steel dies were substituted for these temporary dies. But, meanwhile, the presses had been running . . . getting out panels to meet marketing schedules . . . a typical example of how THE PLASTIC STEEL saves weeks of waiting and countless dollars.

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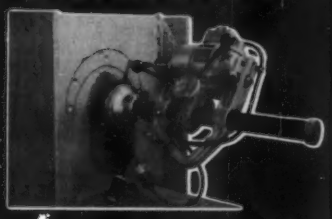
ONLY
MAG-TOOL
HAS
MICROMATIC ADJUSTMENT



MAG-TOOL Drill Presses attach magnetically to ferrous surfaces bringing the capacity of heavy duty presses right to the job!

MICROMATIC ADJUSTMENT enables movement of the drill for precise positioning *after* the press has been attached to the working surface. For example, (see photo) the bit may be easily positioned anywhere between the two curved lines without moving the drill press.
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GET GREATER VERSATILITY IN YOUR POWER OPERATIONS

. . . SPEED PRODUCTION

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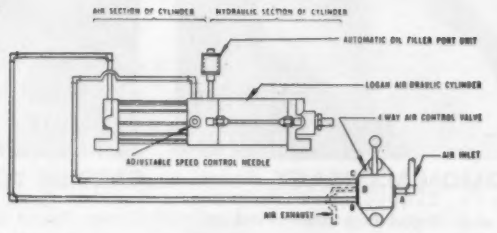

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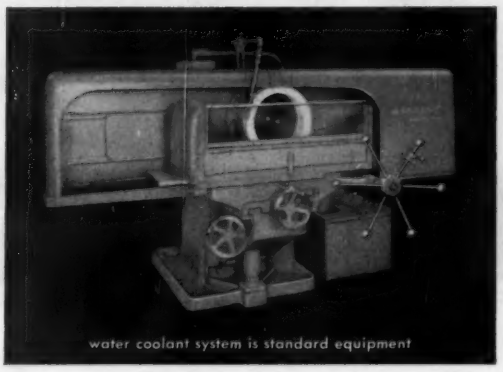

water coolant system is standard equipment

TYPICAL APPLICATIONS ■ Castings . . . eliminates milling or planing . . . requires less stock to be left on for finishing . . . as much as 3/16″ of stock can be saved on each surface. ■ Automobile Body Dies. ■ Plastics Molding Dies. ■ Molded Insulating Fire Brick. ■ Ceramic Insulators. ■ All types of Forging Dies. ■ WHEREVER FLAT, SQUARE SURFACES ARE REQUIRED.

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. . . with Davis & Thompson Roto-Matic and Automatic Ejection

Here's another example of Davis and Thompson Engineering of high production with a minimum of equipment. This GG-8 horizontal threader is equipped with 4 spindles in each head and a 4 station fixture. It is one of countless threading machines that have been designed and built by Davis & Thompson since 1924. Both single and double end machines for pipe, conduit, shafts and similar parts in various production quantities have been produced.

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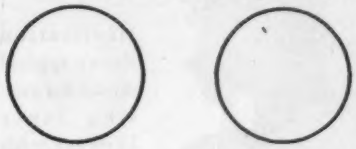
Put these Lenses In...

It's A Welders Goggle #486

Put these Lenses In...



It's A Chippers Goggle #489

...either way it's AO's Safety Engineered

FLEXIBLE MASK GOGGLE

Here's eye protection equipment that can "work overtime." With welding lenses it's a welders' goggle. In a jiffy you can remove these lenses and screw on similar shape clear Super Armorplate lenses for chipping and grinding, using our "482" frame which is directly ventilated. What's more, both safety prescription glasses and regular prescription glasses can be worn comfortably under the "486" and "489" goggle.

QUICK FACTS

Very comfortable soft vinylite mask. Fits closely — leaves no open gaps.

Indirect ventilation louvers prevent lens fogging.

Flame-resistant, plastic lens adapter. Accommodates our standard lens ring and regular 50 mm. round filter lenses and cover lenses.

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Always insist on the AO Trademark on lenses and frames.

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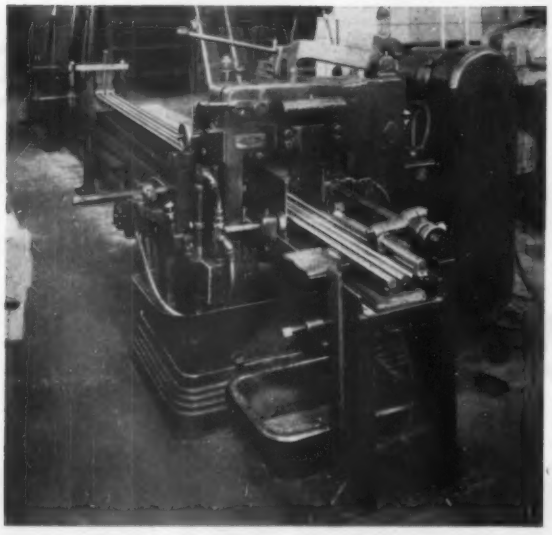
Modine...

MAKES FINISHED CUTS FOR LESS THAN ½ CENT



WITH

PEERLESS Mechani-Cut

The Modine Manufacturing Company has cut cost of sawing finished shafts for use in their unit heaters from approximately 5 cents each to 4 mills each—a saving of more than 4½ cents per cut by installing a 7" x 7" PEERLESS MECHANI-CUT SAW. Manufacturers throughout the country tell the same story of dramatic savings through the use of Peerless equipment.

Only the Mechani-Cut gives you the rigidity of a patented four-sided saw frame. This rigidity enables greater accuracy and faster cutting than any hack saw on the market today.

Consult your Peerless dealer on your metal cutting problem. Eighty Peerless sales engineers and dealers are located throughout the country.

For free literature on Peerless equipment write Dept. A.

PEERLESS MACHINE CO.

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KEYSEATING

The Modern Way

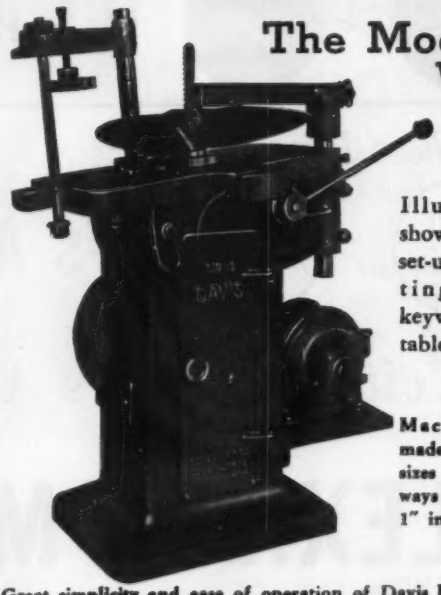

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

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"HILLCO" TANGENT CHASERS

A NEW NAME FOR AN OLD ESTABLISHED PRODUCT

In the interests of standardization the line of ACME Tangent Chasers have been modified slightly in dimensions so that they now are adaptable to other makes of die heads in addition to ACME die heads.

This complete line of tangent chasers is now known as "HILLCO". "HILLCO" tangent chasers can be reground for 80% of their original length. The same precision and long wear are guaranteed that have made our chasers a standard through 75 years of cutting tool manufacture.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION

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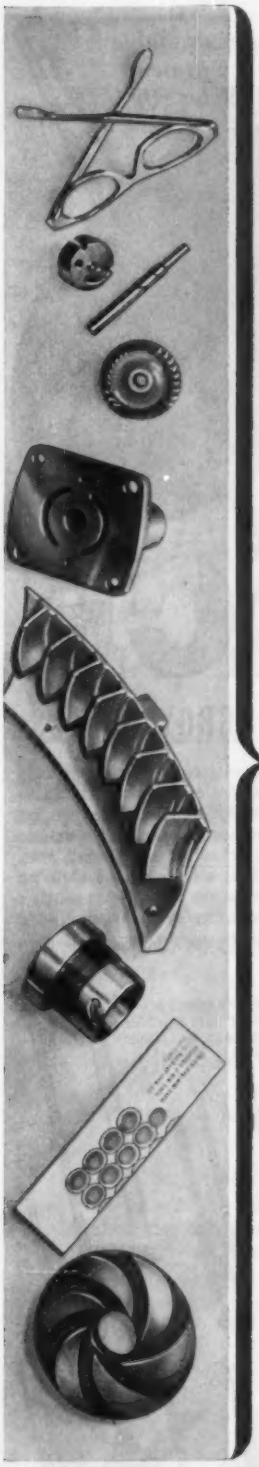

A few examples of work produced on Gorton Pantographs at substantial savings in time and money

240 PIECES PER HOUR

This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

GORTON *Multiple Pantographing*

Volume Production • Precision Tolerances

Tool room accuracy with production line speed is characteristic of Gorton Pantographs. These versatile machines will turn out a dozen . . . or a million . . . finished pieces from one setting with no perceptible variation in required tolerances. From two to six different operations can be performed at each setting with all operations completely automatic within the cutting cycle. In fact, output is limited only by the capacity of the cutter. Spindles turn at 900 to 45,000 RPM providing infinitely variable cutting speeds and feeds.

Shape of part matters little. Two or three-dimensional cutting can be performed on flat, cylindrical, spherical, square or irregularly shaped work. 16 Pantograph models cover a wide range of applications in profiling, grooving, slotting, milling, chamfering, graduating, counter boring, die sinking, mold making, routing, engraving, grinding, burnishing and etching. Models provide manual, semi-automatic and fully automatic cycling. Custom built.

Write for Bulletin 1580-1 -1504

New P1-2 heavy-duty model with 3/8" spindle capacity and 1/2 HP motor available

GORTON

SINCE 1893

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Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

WORLD WIDE *Acceptance*

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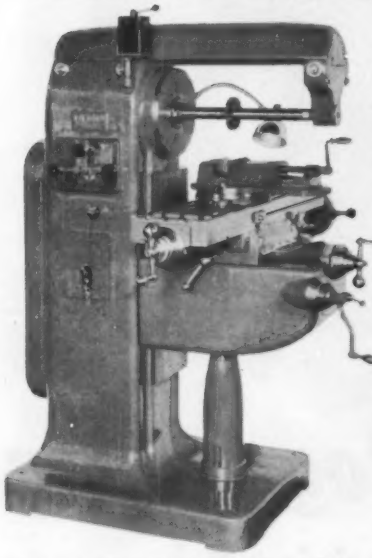

You Get Peak Performance with an INDEX Model "60" HORIZONTAL MILL

• Simple, efficient, compact, with all operating parts enclosed, yet readily accessiblu. Unusually low-priced. Designed for the average tool room, yet highly suitable for production shops through its rigidity and low maintenance cost. Standard table 40" x 9", larger table optional.

The INDEX LINE also includes the Famous "SUPER 55" and the Popular "45" Vertical Mills

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KNURLMASTER

Hand Knurler

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No distortion — even on ⅛" stock! MODEL "C"

For small production runs on ⅛" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

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Been buying costly "specials" for deep hole drilling operations? Then you'll be glad to know that Ace Longboy Drills are now available from stock in a wide range of standard sizes and in both 12" and 18" lengths! What's more, their polished flutes are precision ground in top quality pre-hardened high speed steel to provide a finer finish, keener cutting edges, and longer drill life.

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

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ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

VK "Quality in Millionths"

VK WIRE TYPE PLUG GAGES
XXX TO ZZ ACCURACY

STEEL, CHROMIUM PLATED or TUNGSTEN CARBIDE

The illustration above shows three Van Keuren wire type plug gages, one of steel, one chromium plated, and one of tungsten carbide. All three are Class XXX, accurate within ten millionths of an inch. This is VK "Quality in Millionths".

You may not require tolerances of this order. Van Keuren wire type gages are available in standard tolerances also, from XX to ZZ, in sizes from .001" to 1.000", in steel, chromium plate or tungsten carbide, whichever material best suits your gaging job. Handles may be either Van Keuren or A.G.D. as preferred.

Notice also that VK units in all three materials are not only reversible but long enough to be cut off or cut in half, thus realizing from two to ten gages from each 1⅞" and 2" long unit. This extra length represents extra quality, extra saving, on every Van Keuren wire type unit your company buys.

VK wire type plug gages are fully described in Catalog and Handbook No. 36, available on request. The next time you need quality plug gages in a hurry, telephone The Van Keuren Co., Watertown, Mass. (WA 4-4394). In many cases we can ship your requirements from stock.

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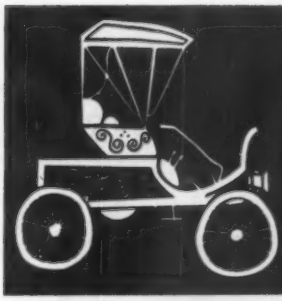

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SMALL DRILLS MUST BE HELD IN PRECISION COLLETS TO ASSURE ACCURACY

LEVIN® MICRO-DRILL PRESS

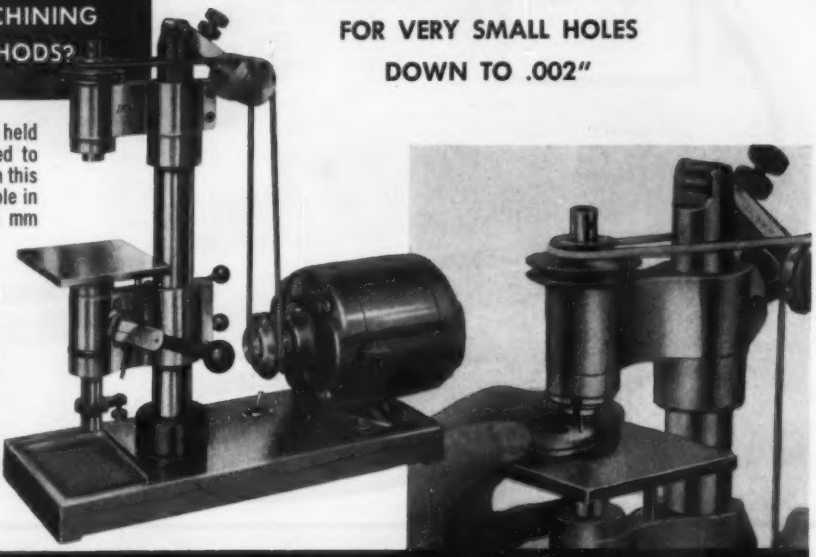
FOR VERY SMALL HOLES DOWN TO .002"

In the LEVIN micro-drill press drills are held in precision collets. Runout is reduced to practically zero and drill breakage from this cause is eliminated. Collets are available in a complete range of sizes down to .1 mm (.004").

SPECIFICATIONS:

Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

Send for catalog M describing complete line of micro-drilling equipment, collets, instrument lathes and precision tools.



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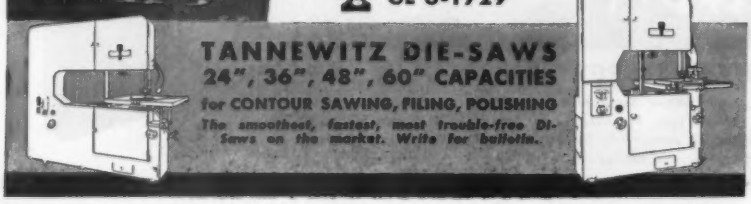

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Now available in a *new edition*... with *new figures.*

This popular booklet points up the important sales problem of personnel turnover in industry. Out of every 1,000 key men (over a 12-month period) 343 new faces appear . . . 65 change titles . . . 157 shift . . . and 435 stay put. These figures are based on average mailing address changes on a list of over a million paid subscribers to McGraw-Hill magazines.

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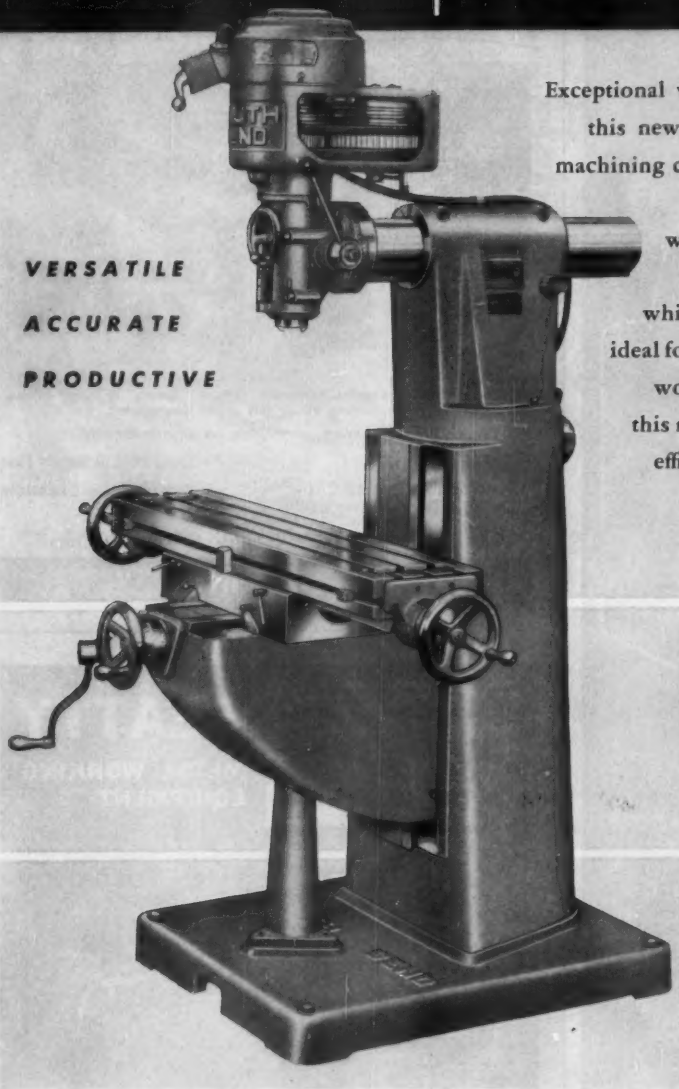
New SOUTH BEND VERTICAL MILLING MACHINE

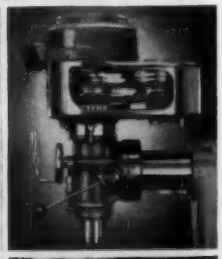


VERSATILE

ACCURATE

PRODUCTIVE

Exceptional versatility, accuracy and speed give this new milling machine the ability to keep machining costs low. Its simplicity of design provides ease of accessibility and set-up which simplify operation and job change-overs. The wide variety of jobs which it can handle makes this machine ideal for toolroom, production and maintenance work. It will pay you to find out how this new milling machine can give you greater efficiency—write for information.



LO-LOSS spindle drive. Precision ground and fitted quill.

Positive action controls with large, adjustable, graduated collars.

Manual table feed standard equipment.

Power longitudinal table feed and automatic quill feed optional.

SPECIFICATIONS

Longitudinal table travel	20″ or 30″
Cross feed	9½″
Spindle to table (max.)	20″
Spindle to column (max.)	20″
Ram travel	15″
Spindle speeds (8)	135 to 3750 r.p.m.
Spindle travel	4″
Head rotation	360°

SOUTH BEND LATHE

423 East Madison Street
South Bend 22, Indiana

MINGANTI
BOLOGNA

VERTICAL MILLING
MACHINE TYPE
FVM 5

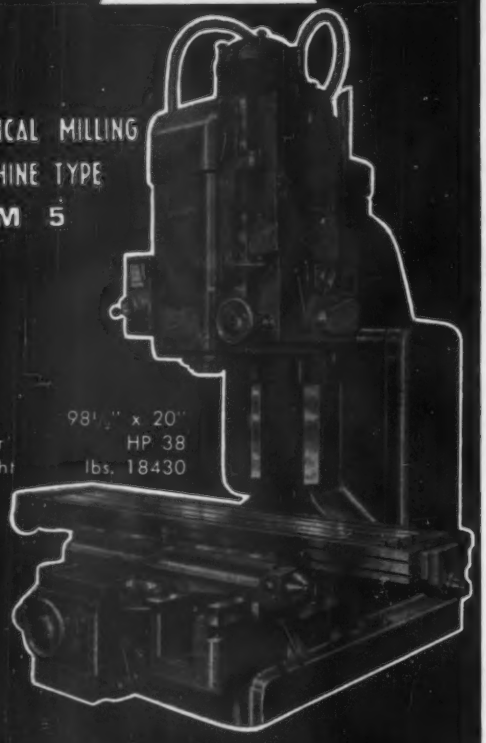


Table 98½" x 20"
Power HP 38
Weight lbs. 18430

Ram Type Turret Lathes - Saddle Type Turret Lathes with hydraulic spindle speed preselector - Automatic Cycle Turret Lathes - Vertical Slotting Machines - Internal Grinding Machines - Precision Vertical Milling and Boring Machines - Diamond Turning Machines - Vertical Milling Machines - Keyway Automatic Milling Machines - Gear Cutting Machines - Transfer Units for Automation.

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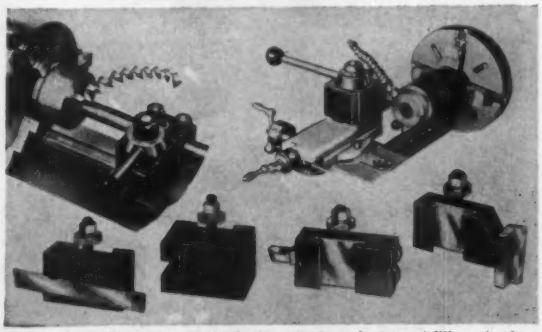
ALORIS QUICK CHANGE TOOL POSTS & HOLDERS
Speed Your Operation .... Save You Money



Only a second to change tools for turning, facing, drilling, boring, threading, knurling, cutting off or any other operation.

- Great Repetitive Accuracy
- Rugged Construction
- Tested and Recommended by Leading Lathe Manufacturers
- Greater Rigidity
- Saves 90% in Set-Up Time
- Unconditionally Guaranteed

Write for catalog and price list.

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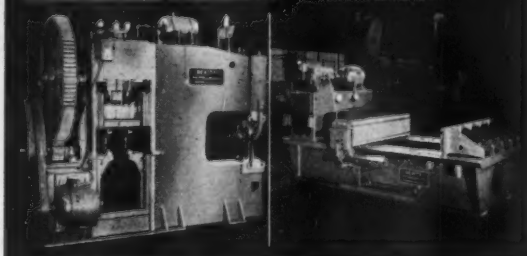
production problems?
better check . . .

BEATTY
METAL WORKING EQUIPMENT



DETAIL BEAM PUNCH (left) — Punches I-beams in just 3 passes instead of the usual 5; eliminates end-for-end turning of beams. Speeds single-hole web and flange punching. 100-ton cap.; 1¼" hole through 1" material. **HORIZONTAL HYDRAULIC BULL-DOZER** (right) — For forming, bending, straightening — rapid production and return speeds boost output: advance — 262" per min.; press — 29" per min.; return — 385" per min.

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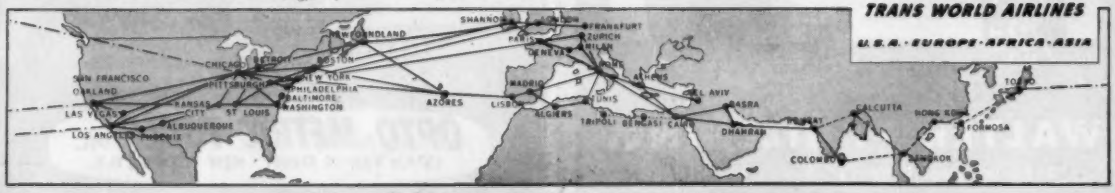

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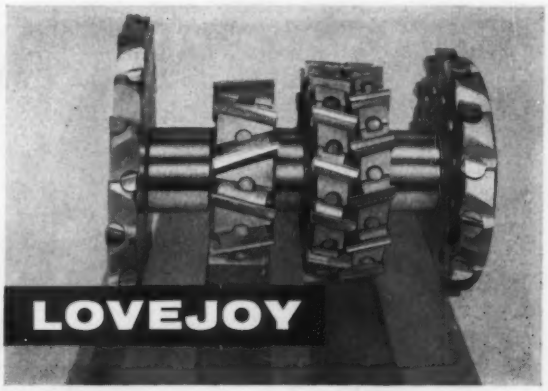

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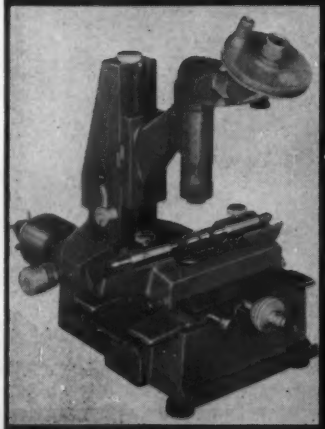

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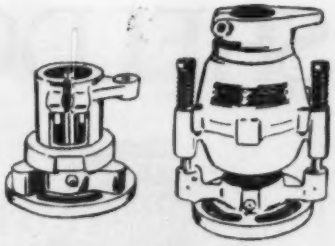

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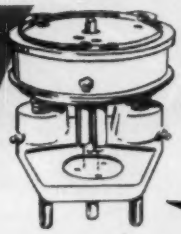
UNIT-ENGINEERED

for drilling or tapping on any drill press



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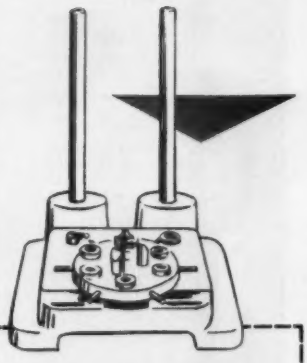

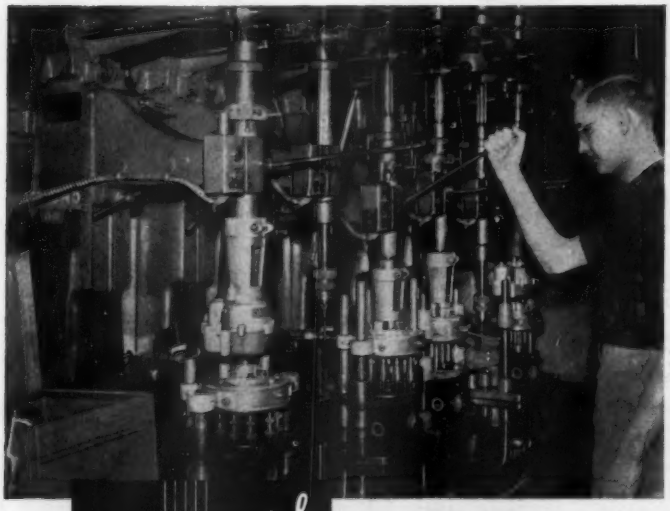

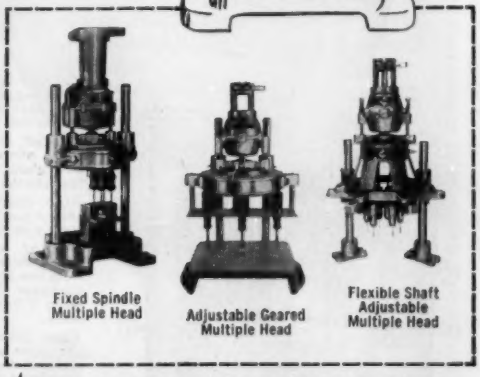

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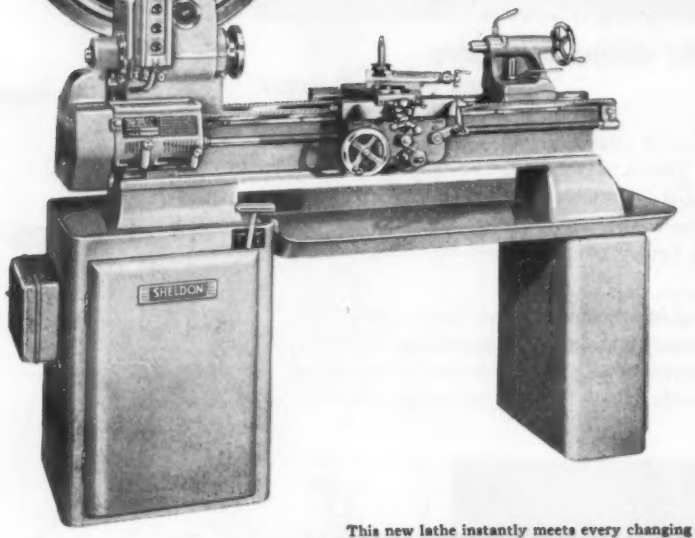

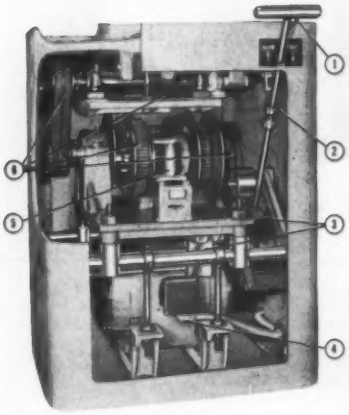

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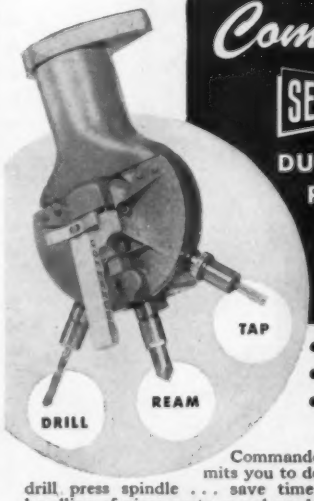

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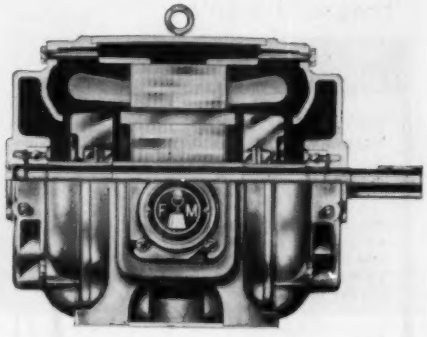

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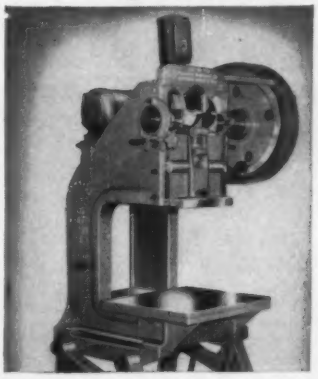

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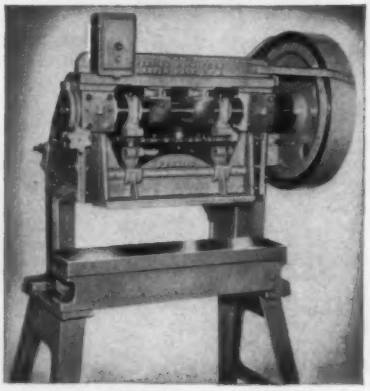

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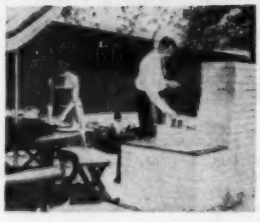
Manufacturing Engineers:

KEY MEMBERS OF OUR DEVELOPMENT TEAM

Early in the development of any new weapon, this question comes up: *is it a producible idea?* Can parts be manufactured to prescribed specs? Does the design, for example, consider bend allowances? And—looking further ahead—can the product be broken down for efficient production? At Chance Vought, these questions are answered by manufacturing engineers on our development team. It's the first of many assignments these professionals undertake in the development of Vought fighters and missiles. Once they've determined that a weapon's producible, then they must make it digestible to the shop. They tailor tooling to prescribed production flow, and they create new machinery for special jobs. They sequence parts fabrication and assembly, and they conduct continuous research into new materials and production techniques. As a result of this research, production at Vought is an ever-changing, advancing program. For creative mechanical, industrial, electrical and civil engineers, it's an exciting, fast-moving career field.

Manufacturing research engineers at Vought design special techniques and forming equipment for materials like high tensile steel, titanium and honeycomb. Here's a Vought-designed model which guided construction of a big hot-forming press for titanium. Examining, are Bill Wood, left, manufacturing research supervisor, and Joe Bayer, manufacturing research engineer.



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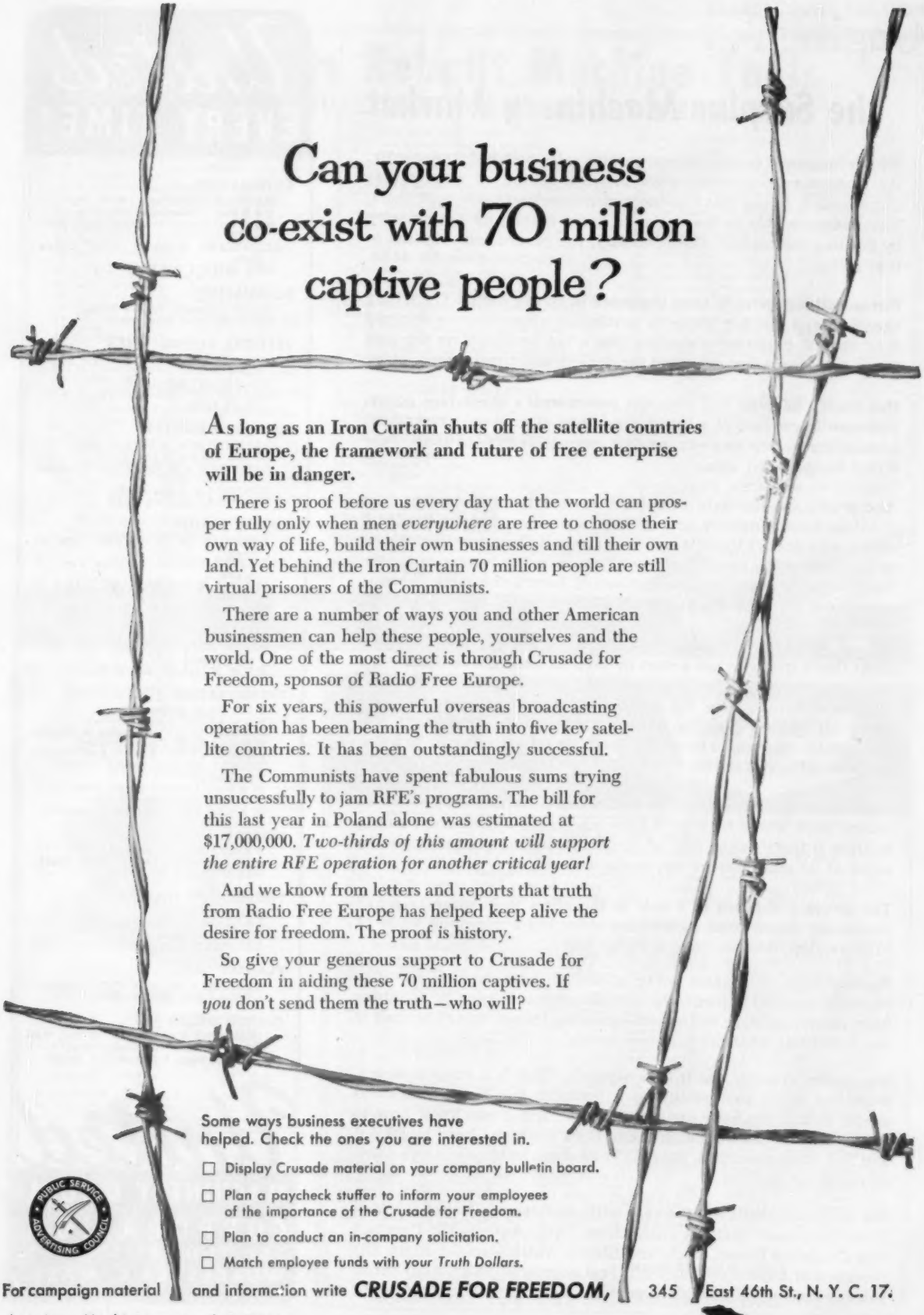

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As long as an Iron Curtain shuts off the satellite countries of Europe, the framework and future of free enterprise will be in danger.

There is proof before us every day that the world can prosper fully only when men *everywhere* are free to choose their own way of life, build their own businesses and till their own land. Yet behind the Iron Curtain 70 million people are still virtual prisoners of the Communists.

There are a number of ways you and other American businessmen can help these people, yourselves and the world. One of the most direct is through Crusade for Freedom, sponsor of Radio Free Europe.

For six years, this powerful overseas broadcasting operation has been beaming the truth into five key satellite countries. It has been outstandingly successful.

The Communists have spent fabulous sums trying unsuccessfully to jam RFE's programs. The bill for this last year in Poland alone was estimated at $17,000,000. *Two-thirds of this amount will support the entire RFE operation for another critical year!*

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Some ways business executives have helped. Check the ones you are interested in.

- ☐ Display Crusade material on your company bulletin board.
- ☐ Plan a paycheck stuffer to inform your employees of the importance of the Crusade for Freedom.
- ☐ Plan to conduct an in-company solicitation.
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Gaging . . .

the Surplus Machinery Market

What's happened to government surplus sales policies? Supposedly, the government's avowed intention when selling off surplus machine tools is to see that the "normal channels of trade" get them. That means selling to the dealer to avoid fouling up the industry by flooding the market. Until recently, the government adhered to that policy.

But something seems to have happened in recent weeks. The selling agencies, and the Air Force in particular, seem to have dropped the "normal channels" principle like a hot potato. Now the idea seems to be come-one-come-all for dealers and direct buyers alike.

One dealer, hopping mad over the government's about-face policy, managed to get hold of a list of purchasers at a recent government surplus machinery sale—found that more than 50% of them were direct buyers.

And that's not the only complaint against the government that used machinery dealers are voicing nowadays. There's hardly a dealer who doesn't think it will be a crime if Congress doesn't pass at least one of the small business bills now in the hopper in Washington—particularly the one that would permit the same depreciation rates for used machine tools as for new.

As one Midwestern dealer puts it, "It's the little metalworking plant that's trying to get a start or keep its head above water—the one that just can't afford new machine tools—that needs help from the government, not the big established ones. The government isn't going to lose anything by helping these people. In fact, it will increase its tax income by giving the little fellow a chance to finish the year with a profit on which he can pay taxes."

And speaking of taxes, we've had a letter from a shop down in Puerto Rico, where they don't have machinery appraisers, wanting to know if there's some rule-of-thumb by which it can estimate the value of its machines for tax purposes.

The owner has heard of a rule to the effect that "close to junk" machinery in any kind of working order has a minimum value of $100 per ton. Anyone have a better rule?

Businesswise, once again we're in one of those depends-on-who-you-talk-to-what-answer-you-get situations. Generally, inquiries have picked up since last report—proving there's money around if the dealer has what the customer wants.

One dealer recently put it in a nutshell, "This is a crazy business. Sales can be up one month, down the next, but they average out pretty well if you have something to sell, and if you know how to find customers and deal with them. It's a cinch you have to get out and find them nowadays, though. They won't beat your doors down trying to get in."

But evidently that's not the case with auctioneers. A spot check of three big recent auctions (Silverking Corp, Aurora, Ill; Camfield Mfg Co, Grand Haven, Mich; and Illinois Watch Case Co, Elgin, Ill) reveals that buyers virtually did beat down the doors at all three. Prices were very high, with direct buyers far outnumbering dealers.

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No. 6JA Fellows, m.d., latest type
No. 645 Fellows, m.d.
No. 624A3 Fellows, m.d.
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No. 645Y Fellows, m.d.
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No. 24-36 Bryant Hole & Face Type, m.d., late
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No. 24-L-36 Bryant, m.d., late
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No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
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No. 75A Heald, m.d., latest
No. 72 Heald, Plain Long Base, m.d., 1941
No. 78 Heald Centerless Cylinder, m.d.
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15 Ton, 60" Stroke, Colonial Vert. Broach
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3"x12" #5 B&S, 1942
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4"x12" #4H Landis, new 1943
6"x18" Norton Type C, new 1943
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#16A-16 Bryant Internal, new 1943
#16-38 Bryant Internal, new 1941
#24-28 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A2 Heald Int. Sizematic, 1944
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R14 Seneca Falls, 16"x36", 1943
120"x96" cc N-B-P, ser. 3380
#5W Cinc Acme Univ. Turret
#4 Gisholt Univ. Tur. A.C.&B.F.
#3H-10 Libby H.D. Tur. 1943
#4A W&S Turret Ser 338969
4FU Fastermatic, tur, 23" sw 1944
8D Potter & Johnston, new 1941

MILLERS

54"x30"x16" Ingersoll Slab, 1934
54"x60"x8" Ingersoll Openside, 1942
Davis & Thompson Vert. 1944
#12-B Pratt & Whitney Profilers
10"x60" P&W Mod. B Thread Mill
#LT 6"x72" L-B Thread Mill
#HT 12"x24" L-B Thread, 1942
#CT 24"x36" L-B Thread, 1942
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60"x48"x30 Hamilton, 4 heads

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226 DoALL Zephyr Hi-Spd. Saw, 1948
15 Ton, 60" Stroke, Colonial Vert. Broach
6" Goss & DeLeeuw 8 spdls. 1941
#306 Barnes Vert. Hone, new 1942
#11RD 2 Hd. W&S Tapper, latest
#36BM G&E 3 Spdl. Bevel Gear
612-A Fellows Gr Shaper 18" cam
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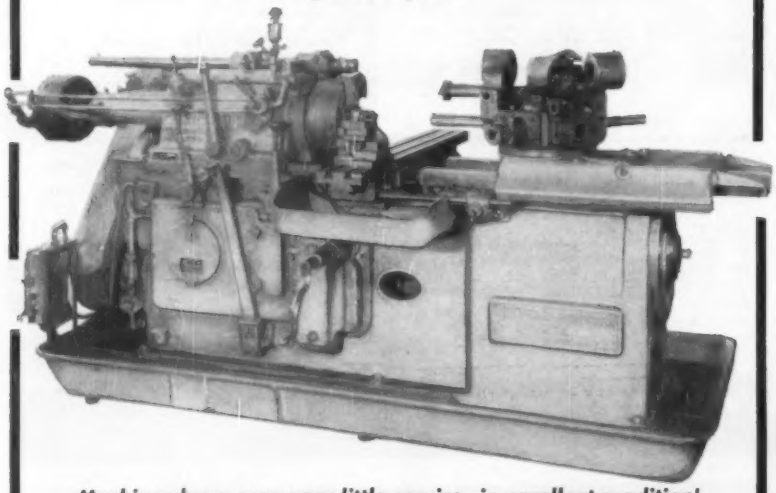

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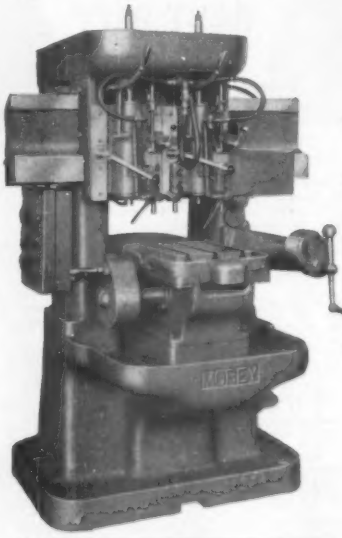

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14"x96" Hill Clarke Plain, AC MD

16"x36" Norton Type C Hydr. Plain, 1942

No. 22 Heald Rotary Surface, 13" chuck, 1942

TURRET LATHES

No. 1A WARNER & SWASEY "Preselector" Saddle Type, Timken, bar feed, 1942

No. 3L GISHOLT "Hydraulic Speed Selector" Saddle Type, Timken, Hard ways, 1942

No. 5 BARDONS & OLIVER "Preselector" Ram Type, Timken, hard ways, bar feed, 1942

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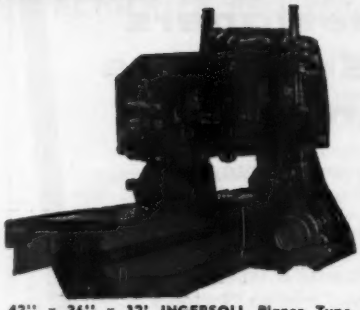

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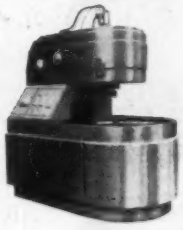

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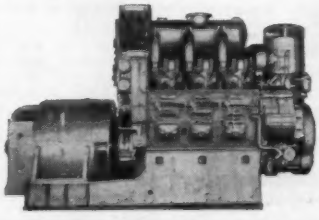

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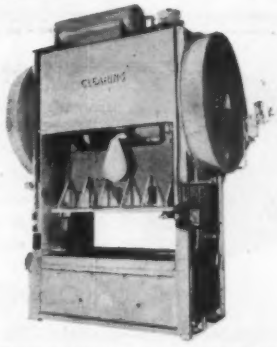

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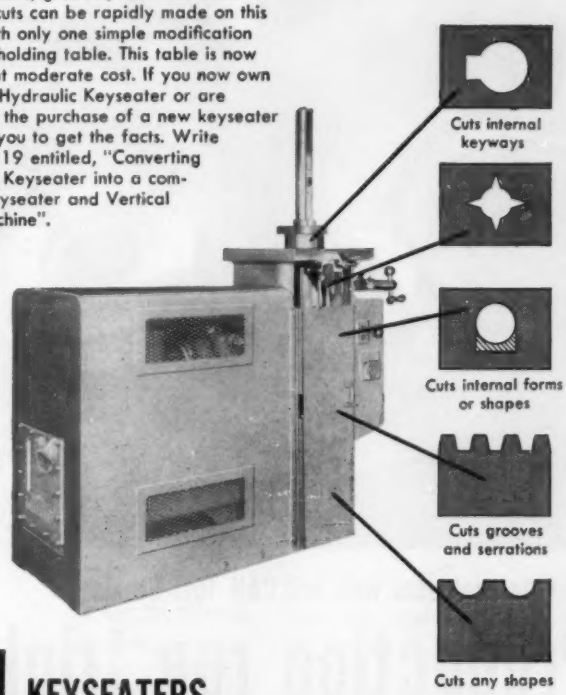

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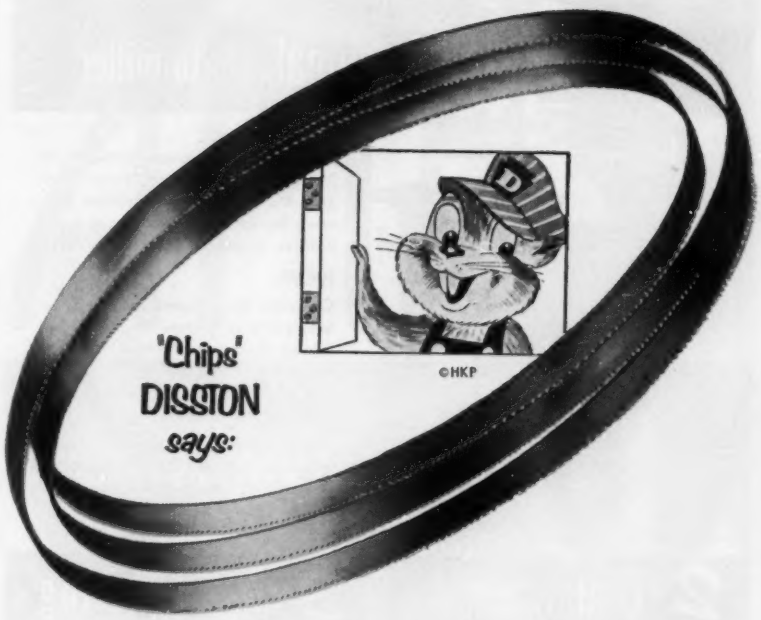

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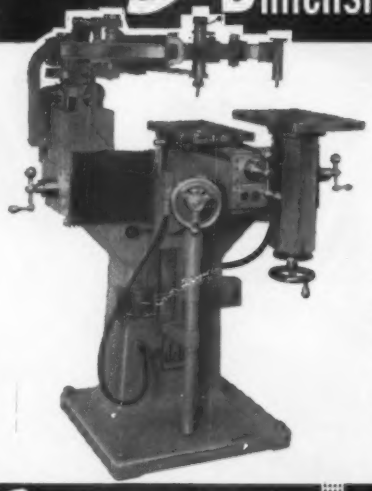

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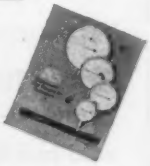

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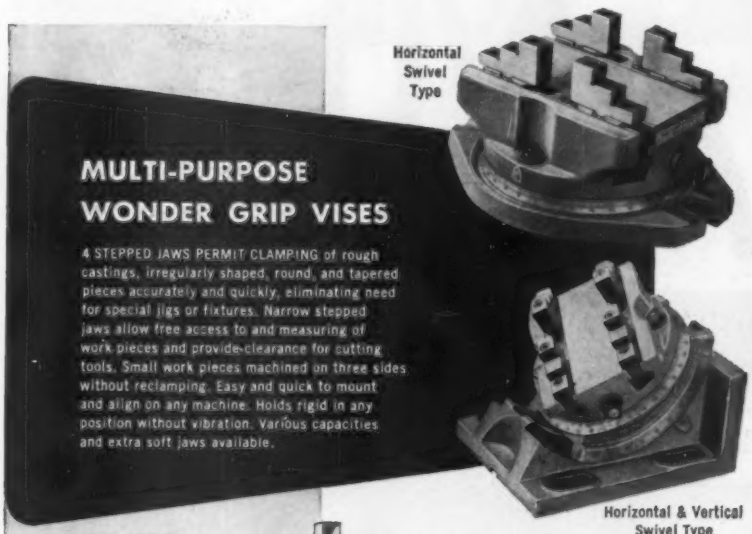

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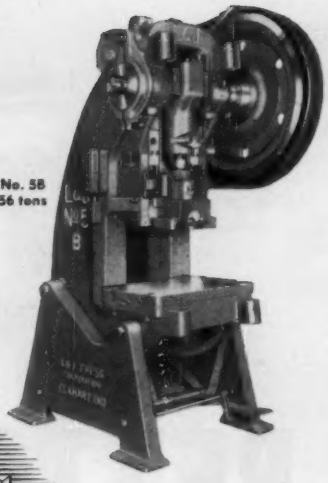

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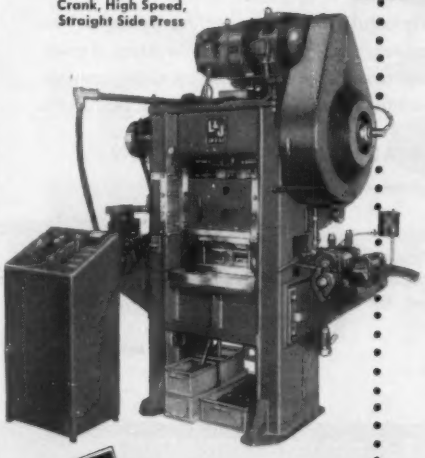

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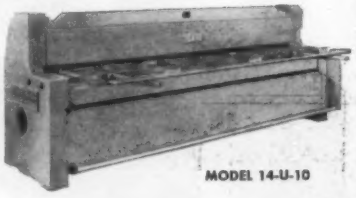

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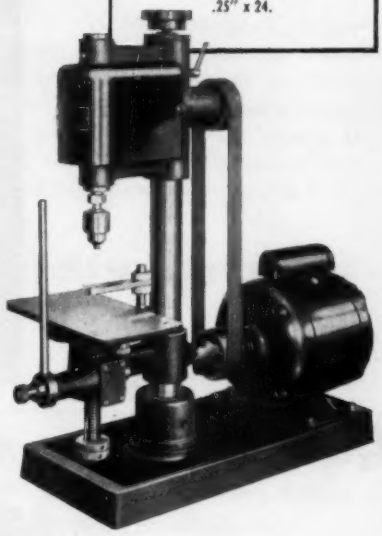

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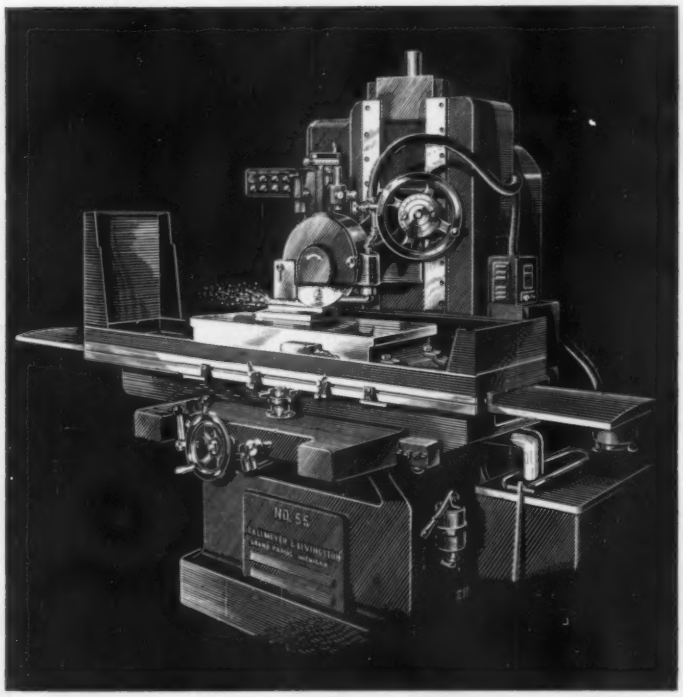

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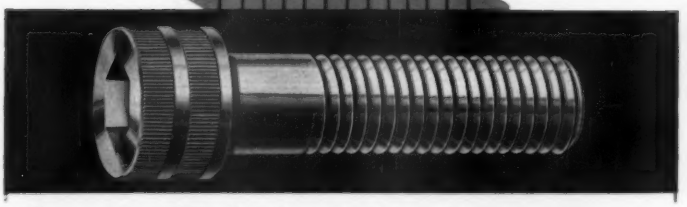

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